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# THE STATISTICAL LAW OF DEMAND AS ILLUSTRATED BY THE DEMAND FOR SUGAR[1]

## PART I. THEORETICAL CONSIDERATIONS

### I. INTRODUCTION

"The disturbance of the conditions of supply by a tax or a bounty . . . ," says Professor Edgeworth, "gives rise to problems too complicated for the unaided intellect to deal with." Certain it is that the popular method of attacking these problems is erroneous. This is evident as soon as one asks, for example, "What is the relation between the tariff on sugar and the

[1] For assistance in the preparation of this paper the author is under many obligations. The computations and the graphs are principally the work of Miss Arcadia D. Near, of the Institute of Economics, who was ably assisted by Mr. Jerome T. Ludlow, of the same institution. Mr. Philip G. Wright and Mr. Isador Lubin, of the Institute of Economics, read the manuscript and made valuable suggestions. Professor Frederick C. Mills, of Columbia University, also read the manuscript and gave most helpful, close, and penetrating criticism. Professor Wesley C. Mitchell, of Columbia University, read the proofs and made valuable suggestions. Professor Henry L. Moore, of Columbia University, not only offered keen and sympathetic criticism of the manuscript and gave generous help with the proofs, but also aided with inspiration, advice, and criticism during the entire preparation of the work. For inaccuracies and inadequacies of analysis, however, the author alone is responsible.

prices paid by the consumer?" The popular method of deriving an answer to this question consists essentially of drawing up tables or graphs showing that prices, after the imposition of the tariff, have risen (or fallen). Of course this proves nothing with respect to the effect of the tariff on prices, because it does not eliminate the *other causes* which have contributed to the price changes. What we desire to know is, not how much higher prices were after the imposition of the tariff than they were before, but how much of the increase is due to the tariff, and how much to other causes. This question may be quite definitely (i.e., quantitatively) answered if we know the coefficients of the elasticities of the domestic and foreign demand and supply.[1a]

The coefficients of the elasticities of demand and supply also enter as factors into the solution of the related problems of the effect of the tariff on consumption, on imports, on the profits of the domestic producers, and on the revenue derived from the duty. These coefficients are also of major importance in the theory of monopoly profits, and in problems connected with price-fixing. In fact, there are many problems in applied economics which remain unsolved only because the numerical values of these constants are not known.

The object of this study is to examine some of the difficulties which arise in the derivation of the elasticity of demand, to indicate how these difficulties may be overcome, and to derive the elasticity of demand for sugar.

## II. THE CONCEPT OF ELASTICITY OF DEMAND

The coefficient of elasticity may be defined as the proportion by which a given relative change in price alters the quantity demanded or supplied, when the relative changes are small. Hence the coefficient of the elasticity of demand—the only coefficient discussed in this study—may be defined as the ratio of the relative change in the quantity demanded to the correspond-

[1a] A. C. Pigou, "The Known and Unknown in Mr. Chamberlain's Policy," *Fortnightly Review*, January, 1904; *Economics of Welfare* (1920), p. 942; H. Schultz, "The Statistical Measurement of the Elasticity of Demand for Beef," *Journal of Farm Economics*, June, 1924.

ing relative change in price, when the relative changes are infinitesimal. In Professor Marshall's words:

> The *elasticity* (or *responsiveness*) *of demand* in a market is great or small according as the amount demanded increases much or little for a given fall in price, and diminishes much or little for a given rise in price. We may say that the elasticity of demand is one, if a small fall in price will cause an equal proportionate increase in the amount demanded: or as we may say roughly, if a fall of one per cent. in price will increase the sales by one per cent.; that it is two or a half, if a fall of one per cent. in price makes an increase of two or one half per cent. respectively in the amount demanded; and so on. (This statement is rough because 98 does not bear exactly the same proportion to 100 as 100 does to 102.)[2]

In mathematical symbols, the coefficient of elasticity of demand, $\eta$, is

$$\eta = \frac{dx}{x} \Big/ \frac{dy}{y} = \frac{d \log x}{d \log y} = \frac{dx}{dy} \cdot \frac{y}{x} \quad \ldots\ldots \qquad (1)$$

where $x$ is the quantity demanded and $y$ the price per unit. If this is numerically equal to 1 for all values of $x$ the demand is neither elastic nor inelastic, but a "constant-outlay demand," and the curve which represents it—a "constant-outlay curve"—is a rectangular hyperbola. If this is numerically greater than unity, the demand is said to be *elastic*, and the curve which represents it cuts the rectangular hyperbola from below. If it is numerically less than unity, the demand is said to be *inelastic*, and the curve which represents it cuts the rectangular hyperbola from above.[3] The size of the coefficient measures the degree of the elasticity.

In connection with this definition two points must be emphasized:

1. The definition presupposes a knowledge of the demand curve. Consequently, any attempt to derive the coefficient of

[2] Alfred Marshall, *Principles of Economics* (8th edition), p. 102 and note.

[3] Cf. Marshall, *op. cit.*, Mathematical Appendix, pp. 839–40; Henry Ludwell Moore, "Elasticity of Demand and Flexibility of Prices," *Journal of the American Statistical Association*, March, 1922.

Marshall gives a negative sign to $\eta$. We have not followed him in this respect for the reason that, as Professor Henry L. Moore has shown, $\eta$ may not infrequently have a positive value.

the elasticity of demand for a commodity without first deriving the equation to the demand curve is apt to lead to difficulties.[4]

2. The coefficient of elasticity relates to *a point* on the demand curve, and may vary in magnitude from point to point. In giving *the* coefficient of elasticity of a commodity, one must, therefore, specify the point on the demand curve to which it applies, unless, of course, the coefficient is the same at every point on the curve.[5]

Marshall gives (p. 102, note) the following rule for determining graphically the coefficient of elasticity at any point (see Fig. 1):

> Let a straight line touching the curve at any point, *P*, meet *OX* in *T* and *OY* in *t*, then *the measure of elasticity at the point P is the ratio of PT to Pt.*
>
> If *PT* were twice *Pt*, a fall of 1 per cent. in price would cause an increase of 2 per cent. in the amount demanded; the elasticity of demand would be two. If *PT* were one-third of *Pt*, a fall of 1 per cent. in price would cause an increase of ⅓ per cent. in the amount demanded; the elasticity of demand would be one-third; and so on.[6]

The objection is sometimes raised that the elasticity *at a point* on a curve, corresponding, as it does, to *infinitesimal* changes in the quantity demanded and in the demand price, *"tells us nothing"* of the elasticity corresponding to *finite* changes. This objection has been elaborated by Professor Dalton,[7] who claims that the distinction between elasticity at a point and elasticity across a finite arc, or, as he terms it, between "point elasticity" and "arc elasticity," is of practical importance.

The distinction may be made clear by reference to a numerical illustration.

Suppose a "constant-outlay demand curve," such that,

[4] Compare Professor Lehfeldt's attempt to derive the elasticity of demand for wheat (*Economic Journal*, 1914, pp. 212 ff.), of which more later.

[5] The equation to a demand curve representing a constant elasticity, $n$, at every point is $xy^n = c$. See Marshall, *op. cit.*, p. 840.

[6] For proof, see *ibid.*, Mathematical Appendix, Note III.

[7] Hugh Dalton, *Some Aspects of the Inequality of Incomes in Modern Communities* (1920), pp. 192–97.

whatever the price of the commodity, $1,200 worth of it will be sold (Fig. 2). The equation to this curve is $xy$=$1,200, where $x$ is the quantity sold and $y$ is the price per unit. We have seen before that so long as we confine ourselves to infinitesimal

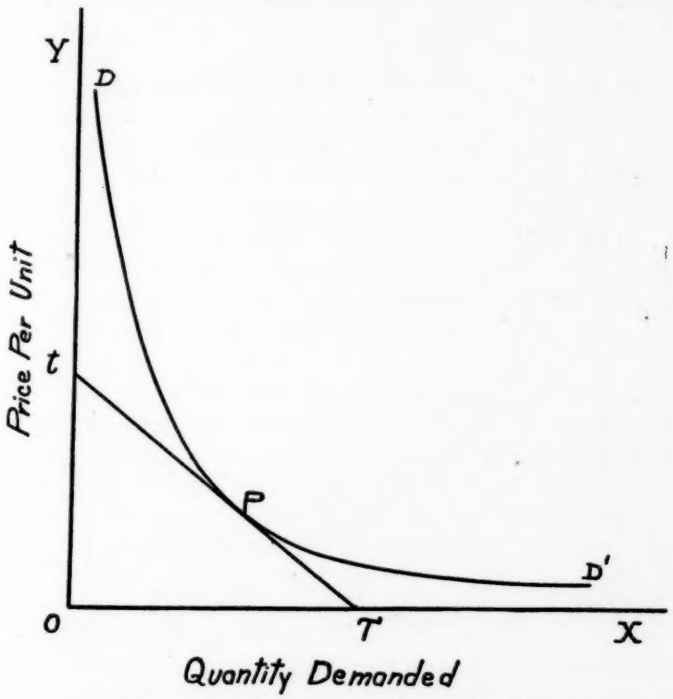


FIG. 1.—Geometrical measure of the elasticity of demand $\eta = TP/Pt$

changes, the elasticity at *every point* on such a curve is equal to one. Furthermore, as this is a constant-outlay curve, "any (small) fall in price will cause a proportionate increase in the amount bought."[8]

Let us now measure the elasticities corresponding to *finite* changes. In other words, let us determine the elasticities cor-

[8] Marshall, *op. cit.*, p. 839.

responding to various *arcs* (not points) on the demand curve. From the equation of the demand curve we know that when the price per unit is \$4.00, the quantity demanded is 300 units. If the price rises from \$4.00 to \$6.00, or by 50 per cent, the quan-

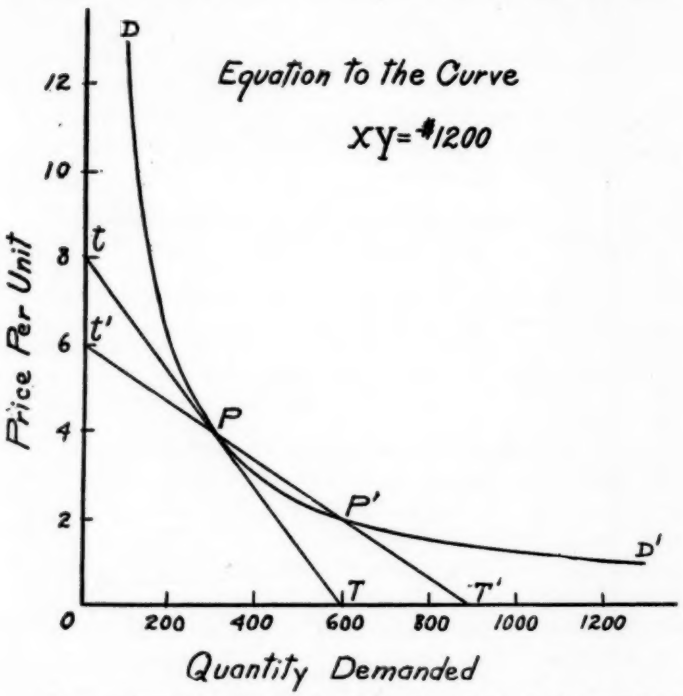


FIG. 2.—Geometrical difference between "point" elasticity of demand and "arc" elasticity of demand.

"Point" elasticity of demand at $P = TP/Pt$

"Arc" elasticity of demand (with base $P$) $= T'P/Pt'$

"Arc" elasticity of demand (with base $P'$) $= T'P'/P't'$

tity demanded drops from 300 to 200, or by 33⅓ per cent, and the elasticity of demand is $-\frac{33\frac{1}{3}\%}{50\%} = -\frac{2}{3}$. If, on the other hand, the price falls from \$4.00 to \$2.00, or by 50 per cent, the amount demanded rises from 300 to 600, or by 100 per cent, and the

elasticity of demand is $-\frac{100\%}{50\%} = -2$. Now let the price return to its former level, that is, let the price rise from \$2.00 to \$4.00, or by 100 per cent. The quantity demanded will fall from 600 to 300, or by 50 per cent. Here the elasticity of demand is $-\frac{50\%}{100\%} = -\frac{1}{2}$. It will be seen from the foregoing examples that, although the *point* elasticity of this curve is always $-1$, the *arc* elasticity is never equal to $-1$; that is, a given *finite* percentage change in price does *not* cause an equal percentage change in the amount demanded. Furthermore, the magnitude of the (arc) elasticity depends upon the particular end of the arc which is taken as a base, or—which is the same thing—upon the *direction* in which the price is assumed to change. It is always numerically greater than 1 for a fall in price and an increase in demand, and is always numerically less than 1 for a rise in price and a decrease in demand.[9]

In view of these differences between point elasticity and arc elasticity, Professor Dalton claims that Marshall's characterization of a constant-outlay curve "contains a definite mathematical error." The particular passage in Marshall's *Principles* to which he takes such vigorous exception is: "If the elasticity of demand be equal to unity for all prices of the commodity, any fall in price will cause a *proportionate*[10] increase in the amount bought, and therefore make no change in the total outlay which purchasers make for the commodity" (p. 839).

Now while it may be freely granted that there is a valid and useful distinction between point elasticity and arc elasticity, and that those formulas in economics which are based on the assumption of small changes in the variables under consideration ought not to be applied to problems in which the changes are large, we cannot go so far as to agree that the passage just quoted "contains a definite mathematical error." There really is no difference between the point elasticity and the arc elasticity of a constant-outlay curve (or of any other curve having a con-

[9] For a general proof of the foregoing see Hugh Dalton, *op. cit.*, p. 195.

[10] Italics are mine.

stant coefficient of elasticity), provided the elasticity is satisfactorily measured. The characteristic of a constant-outlay curve is that any change in price causes a *proportionate* change in the amount bought. Dalton assumes that proportionate changes are best measured by *percentage* increases or decreases, and by making the percentage changes large enough, as in the three arithmetical examples presented above, he obtains widely varying values for his (arc) coefficient of elasticity. But percentages are not good measures of proportionate changes when the bases on which they are computed are not kept constant. Thus a commodity that quadrupled in price and then receded to its former level would show a 300 per cent rise and a 75 per cent drop. A much better measure of proportionate changes is to be had by taking the difference between the *logarithms* of the numbers. The coefficient of elasticity is then simply the ratio of the difference between the logarithms of the quantities to the difference between the logarithms of the prices. When the changes in both quantities and prices are measured *logarithmically*, there is no difference whatsoever between the point elasticity and the arc elasticity of the constant-outlay curve. That the use of logarithms is not only permissible, but almost mandatory, follows at once from the mathematical definition of the coefficient of elasticity given above, namely,

$$\eta = \frac{dx}{x} \Big/ \frac{dy}{y} = \frac{d \log x}{d \log y}.$$

If logarithms are used instead of simple numbers, the demand curve $DD'$ in Figure 2 becomes a straight line whose *slope* measures the coefficient of elasticity.[11] Obviously, it makes no difference whether one measures the coefficient of elasticity, i.e., the slope of the line, by finding the ratio of the base to the altitude of a small triangle (point elasticity) or of a large tri-

[11] The equation to the constant-outlay curve is $xy = c$. Taking logarithms, this becomes $\log x + \log y = \log c$, which may be written $\log y = -\log x + \log c$. This, of course, is the equation to a straight line having a slope of $-1$. By definition,

$$\eta = \frac{dx}{x} \Big/ \frac{dy}{y} = \frac{d \log x}{d \log y} = -1.$$

angle (arc elasticity). The ratio is the same in both cases.

Even if the equation to the demand curve is such that it cannot be reduced to a linear form by logarithmic transformation, it is still more desirable to measure (arc) elasticity by the logarithmic method than by the arithmetic (percentage-change) method. The latter, as was pointed out above, is open to the serious objection that it varies according to the *direction* in which the percentage changes occur. Thus, in the case of the constant-outlay curve given above, the arc elasticity (arithmetically measured) corresponding to a fall in price from \$4.00 to \$2.00 per unit is $-2$, while the corresponding elasticity for a rise in price from \$2.00 to \$4.00 is $-\frac{1}{2}$. This objection is recognized by Dalton himself, but he claims that the difference between these two elasticities "will not generally be large" (p. 195). This claim, however, cannot be substantiated. Dalton's entire argument as to the distinction between point elasticity and arc elasticity is based on the assumption that the changes in the prices (or in the quantities) are large; for, if they are small, arc elasticity even when measured by the arithmetic method is the same as point elasticity for all practical purposes. But when the changes in the variables are large, it does make a difference—and a big one—whether the arc elasticity is measured (arithmetically) from the lower end of the arc or from the upper end.[12]

Basically the difference between arc elasticity and point elasticity is simply a difference between finite differences and

[12] It might appear from the foregoing discussion that too much emphasis is being placed on such elementary notions as the elasticity of demand and the limitations of percentage changes as measures of relative changes, were it not for the fact that lack of familiarity with these notions is sometimes responsible for fallacious economic reasoning. Thus, there are not a few economists who contend that, if the price of a commodity rose by, say, 100 per cent while its supply declined by, say, only 33⅓ per cent, the decrease in the supply *could not possibly* explain the *entire* increase in the price, but that other causes—decline in the purchasing power of money, etc.—must have contributed to the price increase. (Presumably only one-third of the increase can be attributed to the contraction of the supply, while two-thirds must be attributed to other causes!)

What these economists overlook, of course, is that a large or small difference between a percentage change in supply and a corresponding percentage change in price proves absolutely nothing with regard to the existence or non-existence of

infinitesimals. The prices and quantities which go to make up any demand schedule proceed, of course, by finite differences, which are frequently very large. In the words of Professor Edgeworth, they "may be likened to a net with meshes so wide as to lose half the catch." From such data we can derive arc elasticity—which may or may not have any significance—but no point elasticity. When, however, we "fill up the vacant spaces with a finer reticulation" by passing a continuous curve through the points, we can derive from it both the point elasticity and the arc elasticity, and judge the significance of the latter. The thing to remember, therefore, is that in order to derive an unequivocal coefficient of elasticity we must first derive the equation to the demand curve, or the law of demand. To this we now turn.

### III. THE LAW OF DEMAND

The concept of demand which is most useful to the statistical economist is that which was first propounded by Cournot nearly a century ago. Brushing aside such meaningless and sterile statements as "the price of goods is in the inverse ratio of the quantity offered, and in the direct ratio of the quantity demanded," Cournot stated the concept of demand in the following unambiguous terms: "Let us admit," said he, ". . . . that the sales or the annual demand $D$ is, for each article, a particular function $F(p)$ of the price $p$ of such article. To know the form of this function would be to know what we call the *law of demand* or *of sales*."[13] Some of the essential features of this law may be summarized as follows:

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"other causes." Even under static conditions where "all other things remain equal" by hypothesis, a given percentage change in supply may bring about almost any imaginable percentage change in price, especially when the percentage changes are large.

In Figure 2 for example, there is traced a demand curve with a coefficient of elasticity of demand of $-1$ at every point on the curve. That is to say, a 1 per cent reduction in the supply always brings about a 1 per cent (approximately) increase in price. In the same curve, however, a $33\frac{1}{3}$ per cent reduction in the supply brings about a 100 per cent increase in price!

[13] *Researches into the Mathematical Principles of the Theory of Wealth*, p. 47.

1. The function $F(p)$ which expresses the law of demand or of the market is assumed to be a *continuous* function. That it might be otherwise if the number of consumers were very limited is clearly recognized. But the economist is not interested so much in the individual demand functions as in the corresponding aggregate or collective function. The latter tends to be continuous.

The statistical conclusion to be drawn from this is that the observations must be numerous.

2. The law of demand or the demand curve relates to a given country or market. "It is well known that by *market* economists mean, not a certain place where purchases and sales are carried on, but the entire territory of which the parts are so united by the relations of unrestricted commerce that prices there take the same level throughout, with ease and rapidity.[14]

In any statistical investigation of the demand for a commodity, the market to which it relates must be specified. The exact boundaries of a market are, however, sometimes difficult to determine. In this connection Professor Fetter's "Economic Law of Market Areas"[15] may be helpful.

3. The law of demand relates to a *point* in time. In most statistical investigations, however, the year is taken as the natural unit of time; that is, the quantities studied are those which are sold *annually,* and the prices with which the quantities are compared are *average annual* prices. But, as Cournot pointed out, both the price and the law of demand of a commodity may vary considerably during the year.[16] This raises some interesting questions: Is it possible for a commodity to have an *elastic* demand during one season and an *inelastic* demand during another? Suppose that monthly data of consumption (or production) and prices yield an elastic (or inelastic)

[14] *Ibid.*, p. 51, footnote.

[15] *Quarterly Journal of Economics*, May, 1924.

[16] Cournot, *op. cit.*, p. 52. The author is quite satisfied that the elasticity of demand for beef varies greatly between summer and winter. See "The Measurement of the Elasticity of Demand for Beef," *Journal of Farm Economics*, July, 1924, pp. 275–76.

demand. Would annual averages derived from the same data also yield an elastic (or inelastic) demand? It is to be hoped that statistical data will be forthcoming which will enable one to derive specific answers to these questions.

Should the available data for any particular commodity enable one to derive seasonal demand curves as well as the average of such curves, that curve will, of course, be chosen which, for the purposes of the investigation in question, is the most significant. Thus, for the purpose of determining the effects of a duty on the conditions of supply, seasonal demand curves would be of little significance; for the purpose of determining a corporation's sales policy, however, they would be of very great utility.

4. The demand curve may represent price either as a function of the amount demanded or "consumed" by the buyers (non-possessors) only, or as a function of the amount demanded by both buyers and sellers (non-possessors and possessors). Thus, a demand curve for potatoes may represent either (1) the "amounts which will be bought" at each of a variety of prices, or (2) the *total* amount which will be "taken" at each price, which includes not only the amount bought by "consumers," but also the amount kept by farmers for their own use and for feeding, as well as the amount left in the ground in case the price obtainable does not pay the costs of harvesting.[17] The first is the more common concept of the demand curve. For some purposes, however, the second concept is more useful.

The *rationale* of the second or more general concept of demand is clearly stated by Professor Davenport in his *Economics of Enterprise*:

> In any market where owners of goods will sell only if they can "get their price," and owners of money buy only if they can "get their money's worth," it is evident that the men on both sides of the market have made an appraisal of the thing *owned* relatively to the thing *offered*. This fact

[17] Cf. Holbrook Working, "Factors Determining the Price of Potatoes in St. Paul and Minneapolis," *Technical Bulletin 10, University of Minnesota Agricultural Experiment Station* (October, 1922), p. 17.

points to the similarity between the demand and supply side of any particular exchange; the owners of hats may be thought of as having either a supply of hats or a demand for money,—the owners of money as having either a demand for hats or a supply of money. Each side has things for exchange, with limits on exchange expressed in the other thing.

Because of this similarity it is possible to combine the buyers' and sellers' money estimates of hats into one schedule which will express for each man the relation for him between money and hats. . . . (pp. 48–51).

It is . . . . evident that if we decide to regard the money side of the situation as demand for hats, and the hat side of the situation, not as demand for money, but only as supply of hats, we must recognize the holders of hats as themselves having demands for hats (p. 51).

And again,

. . . . the reservation prices of the sellers are, in ultimate analysis, demands, and are as important to the fixation of price, and important in precisely the same way, as are the price paying dispositions of the seekers for goods (p. 55).

Another strong champion of this concept is P. H. Wicksteed. Wicksteed takes up the question of the rôle which the supply curve plays in the determination of price in the following words:

But what about the "supply curve" that usually figures as a determinant of price, co-ordinate with the demand curve? I say it boldly and baldly: There is no such thing. When we are speaking of a marketable commodity, what is usually called a supply curve is in reality a demand curve of those who possess the commodity; for it shows the exact place which every successive unit of the commodity holds in their relative scale of estimates. The so-called supply curve, therefore, is simply a part of the total demand curve. . . . .[18]

It must be emphasized, however, that the insignificant state to which these economists would reduce the supply curve relates only to its generally accepted rôle as a factor in price determination co-ordinate with the demand curve. If all that we desire to know is the *price* at which a given exchangeable commodity will sell in the market, the "supply curve" is not necessary. The price is fixed absolutely by two determinants: (1) the general or total demand curve (of which the "supply

[18] "The Scope and Method of Political Economy in the Light of the 'Marginal' Theory of Value and Distribution," *Economic Journal*, March, 1914, p. 13.

curve" is a part), and (2) the amount of the actual supply existing in the community. "This is not a curve at all, but an actual quantity." If, however, what we wish to know is not simply the price at which the commodity will be sold, but also the number of units that will change hands, and whether the price is in stable or unstable equilibrium, we must have recourse to the ordinary method of presenting the general demand curve in two sections: the ordinary conventional demand curve of the purchasers, and supply curve of the sellers.

That these are valid conclusions may be illustrated by reference to a hypothetical example.[19] Suppose that in a given market for hats there are five buyers, $B_1$, $B_2$, $B_3$, $B_4$, and $B_5$, and

TABLE I*

| | |
|---|---|
| $B_1$ is willing to buy one hat for \$5.00 | |
| $B_2$ is willing to buy one hat for \$4.00 | $S_1$ is willing to sell one hat for \$4.00 |
| $B_3$ is willing to buy one hat for \$3.00 | $S_2$ is willing to sell one hat for \$3.00 |
| $B_4$ is willing to buy one hat for \$2.00 | $S_3$ is willing to sell one hat for \$2.00 |
| $B_5$ is willing to buy one hat for \$1.00 | $S_4$ is willing to sell one hat for \$1.00 |

* Professor Henry L. Moore calls attention to the implicit assumption made in this example, i.e., that each seller has only one unit to sell and each buyer will take only one unit. This purely hypothetical assumption does not, however, invalidate the use of the example for the purpose of illustrating how the general demand schedule may be derived from the buyers' and sellers' schedules.

four sellers, $S_1$, $S_2$, $S_3$, and $S_4$, and that the situation is as shown in Table I.

Under these conditions, what will the price be?

It is evident that if $B_1$ is willing to buy one hat for \$5.00, he certainly would be willing to buy it at a price less than \$5.00, so that when the price is \$4.00, the number of hats demanded is two (one by $B_1$ and one by $B_2$); when the price is \$3.00, the number of hats demanded is three (one by $B_1$, one by $B_2$, and one by $B_3$); etc. Similarly, if $S_4$ is willing to sell one hat for \$1.00, he certainly would be willing to sell it at a higher price, so that when the price is \$2.00, two hats are offered on the market (one by $S_4$ and one by $S_3$); when the price is \$3.00, three hats are offered on the market (one by $S_4$, one by $S_3$, and one by $S_2$); etc. Proceeding in this manner, we obtain the demand and supply schedules shown in Table II.

[19] Cf. H. J. Davenport, *Economics of Enterprise*, pp. 47–51.

It is clear from these schedules that the market price will be $3.00, for at this price the number of hats demanded is equal

TABLE II

| Price | Quantity Demanded | Quantity Supplied |
|---|---|---|
| $5.00 | 1 | ..... |
| 4.00 | 2 | 4 |
| 3.00 | 3 | 3 |
| 2.00 | 4 | 2 |
| 1.00 | 5 | 1 |

to the number supplied. As there are four hats on the market, one hat will not find a purchaser. ($S_1$ is not willing to sell his hat for less than $4.00.)

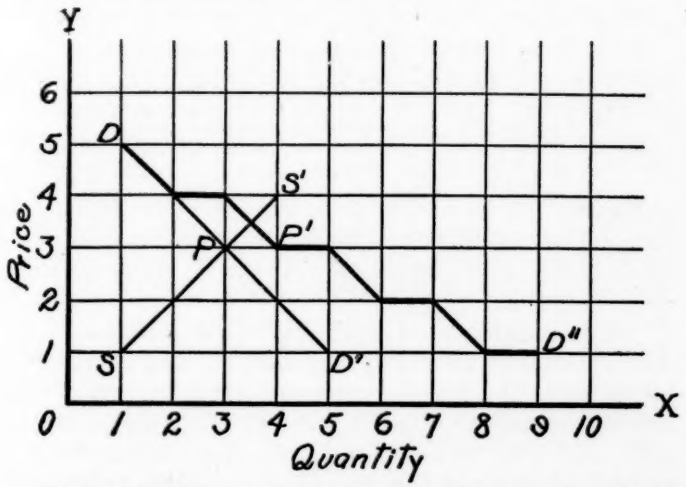


FIG. 3.—The relation between the general demand curve and the particular demand and supply curves.

When these schedules are represented graphically, we have the usual demand and supply curves. In Figure 3, $DD'$ is the demand curve of the buyers and $SS'$ is the supply curve of the sellers. The intersection of the two curves is at the point $P$. From the co-ordinates of this point ($X=3$, $Y=3$) we know

that three hats will be sold and that the price will be $3.00 per hat. From the *positive slope* of the supply curve *SS'* we know that the demand and supply are at stable equilibrium at *P*.

Now let us combine both buyers' and sellers' schedules into one general demand schedule. Since the owners of hats may be thought of as having either a supply of hats or a demand for money, and the owners of money as having either a demand for hats or a supply of money, the market situation may be represented as shown in Table III.

TABLE III

| Those Who Have Hats | Those Who Have Money | |
|---|---|---|
| | $B_1$..... | estimates 5 of money as equal to 1 hat |
| | $B_2$..... | estimates 4 of money as equal to 1 hat |
| $S_1$..... | ..... | estimates 4 of money as equal to 1 hat |
| | $B_3$..... | estimates 3 of money as equal to 1 hat |
| $S_2$..... | ..... | estimates 3 of money as equal to 1 hat |
| | $B_4$..... | estimates 2 of money as equal to 1 hat |
| $S_3$..... | ..... | estimates 2 of money as equal to 1 hat |
| | $B_5$..... | estimates 1 of money as equal to 1 hat |
| $S_4$..... | ..... | estimates 1 of money as equal to 1 hat |

In Figure 3 this general demand schedule is represented graphically by the curve *DP' D''*. Thus $B_1$'s estimate is represented by the point 1,5; $B_2$'s estimate by the point 2,4; $S_1$'s estimate by the point 3,4; etc.

This general demand curve may also be obtained directly from the conventional demand curve *DD'* and the conventional supply curve *SS'*. We may begin with the highest price. Only one hat is demanded or valued at $5.00. This is represented by the point *D*, whose co-ordinates are 1,5. When the price is $4.00, two hats are demanded and four hats are supplied. But the demand for two hats at $4.00 apiece *includes* the demand for one hat at $5.00; and the supply of four hats at $4.00 apiece *includes* the supply of three hats when the price is $3.00. Hence when the price is $4.00, one *additional* hat is supplied and one is demanded. That is to say, there are *two* hats which are valued at $4.00 apiece. This fact is represented by the points, 2,4 and 3,4. When the price is $3.00, three hats are demanded and three

are supplied. But the demand for three hats at this price *includes* the demand for two hats when the price is $1.00 higher, and the supply of three hats at this price *includes* the supply of two hats when the price is $1.00 less. Hence when the price is $4.00 per hat, another *additional* hat is demanded and one more *additional* hat is supplied. In other words, there are *two* hats which are valued at the rate of $3.00 for 1 hat. This fact is represented by the points whose co-ordinates are 4,3 and 5,3 respectively. Proceeding in this manner we obtain the *general* demand curve *DP' D''*.

Having thus derived the general demand curve, how may we obtain the price at which the hats will be sold?

A glance at Figure 3 will show that the price is *not* given by the ordinate of the point at which this general demand curve *DP' D''* crosses the supply curve *SP S'*. To determine the market price when we are given a general demand curve, all that we need to know is simply the total quantity available. We have seen that there are altogether four hats on the market. The ordinate of the curve *DP'D''* corresponding to this supply is *P'*4=3. That is to say, the price will be $3.00 per hat, which agrees with the result obtained from *DD'* and *SS'*.

It will be observed that the general demand curve *DP' D''* does not tell us how many units exchanged hands. Furthermore, since it is impossible to tell from the general curve whether the supply curve which it includes has a positive or negative slope, it is also impossible to tell whether the price *P'*4 is stable or unstable.

The foregoing discussion has an important bearing on problems connected with the derivation and interpretation of statistical laws of demand. All concrete laws of demand are based on observations, i.e., on statistical records, of prices paid and amounts sold or produced at various times. These records are, of course, nothing more than co-ordinates of various points on an unknown demand curve, affected by many disturbing factors. The statistical problem is to derive the most probable demand curve suggested by these observations. Whether, therefore, any statistical law of demand represents the demand function of

both buyers and sellers, or that of buyers only, depends upon the nature of the statistical data on which it is based. If, for example, we are given the annual production of potatoes *including the amount left to rot in the ground, the amount fed to hogs, etc.*, and the corresponding prices, we have a series of points or observations, such as $P'$ and $D''$ (Fig. 3), affected of course by disturbing factors. The law of demand derived from these observations will be a general demand curve. Such a demand curve must not be put in juxtaposition with a supply curve. If, on the other hand, we are given the quantities sold and the corresponding prices, we have a series of observations or points such as $P$. The law of demand derived from these observations will be a particular (or buyers') demand curve. In practice, however, it may often be impossible to derive a purely buyers' or a purely general demand curve, owing to the unsatisfactory nature of the available statistics and to the fact that the two curves may coincide for part of the distance.

5. The most common demand curve is the locus of a point $P$ whose abscissa represents the number of units demanded and whose ordinate represents the *price per unit* (see Fig. 2). There are, however, other kinds of demand curves. Thus, if in the above demand curve we let the ordinate represent *not* the price per unit, but the *total amount of money* (or any other specified article) given in exchange for the quantity represented on the $X$-axis, we have the integral curve which is frequently used for representing demand in international trade. In this study, however, only the more common demand curve will be dealt with.

## IV. LIMITATIONS OF THE STATIC LAW OF DEMAND

The limitations of the static law of demand have been discussed by Marshall[20] and, more especially, by Edgeworth.[21] At this point only two difficulties need be mentioned.

1) In *theory* the law of demand for any one commodity is given only on the assumption that the prices of all other com-

[20] *Op. cit.*, pp. 109–19.

[21] Article on "Demand Curves," in Palgrave's *Dictionary of Political Economy*, I, 554.

modities remain constant (the old *ceteris paribus* assumption). This postulate fails in the case of commodities for which substitutes are available. Thus when the price of beef is changed markedly, the prices of such rival commodities as mutton, veal, and pork cannot be supposed to remain constant. Likewise, the price of sugar cannot be increased beyond a certain point without affecting the prices of glucose, corn sugar, and honey.

2) The validity of the theoretical law is limited to a point in time. But in order to derive *concrete, statistical* laws our observations must be numerous; and in order to obtain the requisite number of observations, data covering a considerable period must be used. During the interval, however, important dynamic changes take place in the condition of the market. In the case of a commodity like sugar, the principal dynamic changes that need be considered are the changes in our sugar-consuming habits,[22] fluctuations in the purchasing power of money, and the increase of population.

These (and other) difficulties led Professor Edgeworth to say ". . . . it may be doubted whether Jevons' hope of constructing demand curves by statistics is capable of realization." [23] It remained, however, for Professor Moore to show that, no matter what may be the number of disturbing elements affecting the quantity demanded or its price, no matter how complex the functional relation between them, their relative influence or strength may be quantitatively determined and allowed for[24]—at least for all practical purposes.

## V. THE STATISTICAL APPROACH TO THE PROBLEM

When we attempt to derive a law of demand from statistics, the problem of the disturbing factors presents itself in the fol-

[22] The per capita consumption of sugar in the United States increased from 52.8 pounds in 1890 to 95.6 in 1923.

[23] *Op. cit.*, p. 544.

[24] Henry Ludwell Moore, *Economic Cycles* (1914), chap. iv, "The Law of Demand"; *Forecasting the Yield and Price of Cotton* (1917), pp. 101–15, and chap. v, "The Law of Demand for Cotton"; "Empirical Laws of Demand and Supply and the Flexibility of Prices," *Political Science Quarterly*, December, 1919; "Elasticity of Demand and Flexibility of Prices," *Journal of the American Statistical Association*, March, 1922.

lowing form: Shall the resultant of the disturbing factors which affect the price of the commodity and the resultant of the disturbing factors which affect the quantity of the commodity be eliminated by a single statistical device? Or shall each factor be accounted for separately? Thus, suppose that the price of sugar is really a function of four variables: the quantity of sugar demanded, the price of glucose, the price of corn sugar, and the price of honey; but that we are chiefly interested in the relation between the price of sugar and the quantity of it which is demanded. Shall we first adjust the statistics of prices and consumption for the resultant of changes in the other variables —assuming that such an adjustment is possible—and then derive the desired relationship by considering the price of sugar as a simple function of only one variable, the quantity demanded, or shall we actually express the price of sugar as a function of all the four variables?

There can be no doubt but that the second method of approach is theoretically the more desirable solution of the problem, for it not only yields what Professor Moore has termed a "dynamic law of demand in its complex form," but it also permits us to derive the static law of demand at the same time. This will be evident if our problem be put into algebraic form: Suppose that, following Professor Moore's notation,[25] we let $X_0$ be the percentage change in the price of a commodity, say sugar, and $X_1$ the percentage change in the amount of the commodity that is demanded. Then the dynamic law of demand may be represented as follows:

$$X_0=\phi(X_1, X_2, X_3, \ldots, X_n) \qquad (2)$$

where $X_2$, $X_3$, . . . . $X_n$ are percentage changes[26] in other factors, say, prices of glucose, prices of honey, etc. Neither the form of the function $\phi$ nor the interrelations of $X_1$, $X_2$, $X_3$, . . . . , $X_n$, are known. In any practical problem, however, we may find effectual means of overcoming these difficulties. We

[25] For a full and suggestive treatment of the various methods, the reader must be referred to Professor H. L. Moore's *Forecasting the Yield and Price of Cotton*, chaps. v–vi.

[26] The reason why Professor Moore uses percentage changes will become apparent later.

may, "with due precautions against spurious results," experiment with different types of function $\phi$ and of the interrelations of $X_1, X_2, X_3, \ldots, X_n$, and select those types which enable us to determine $X_0$ with the degree of accuracy sufficient for the problem in hand.

As a first approximation we choose the simplest possible function,

$$X_0=\phi(X_1, X_2, X_3, \ldots, X_n)=a_0+a_1X_1+a_2X_2+a_3X_3+\ldots+a_nX_n. \quad (3)$$

As both the form of the function $\phi$ and the interrelations of the $X_1, X_2, \ldots, X_n$, are assumed to be linear, the method of multiple correlation immediately suggests itself for determining the values of the constants $a_0, a_1, \ldots, a_n$ and the correlation between $X_0$ and the right-hand members of (3). An excellent illustration of this method is afforded by Professor Moore's derivation of the law of demand for cotton. Indeed, it would seem as if the method of multiple correlation were expressly invented for the purpose of deriving dynamic laws of demand.

This simple linear function will probably give good results in the majority of cases, especially where a sufficiently large number of variables are considered. If it should fail to do so, that is, if the error involved in determining $X_0$ from the simple function should turn out to be too large for the problem under consideration, we may take as a second approximation to our function $\phi$ some more general equation, as

$$\left.\begin{aligned} X_0=\phi(X_1, X_2, X_3, \ldots, X_n)&=a_{00}\\ &+a_{01}X_1+b_{01}X_1^2+c_{01}X_1^3+\ldots\\ &+a_{02}X_2+b_{02}X_2^2+c_{02}X_2^3+\ldots\\ &+a_{03}X_3+b_{03}X_3^2+c_{03}X_3^3+\ldots\\ &+\ldots\ldots\ldots+ \end{aligned}\right\} \quad (3a)$$

and determine the constants of this equation and the correlation between $X_0$ and the right-hand member of (3*a*).

Both (3) and (3*a*) are examples of a "dynamic law of demand in its complex form." These equations, however, also include the *static* law of demand as a special case. Thus, if in

these equations we single out $X_1$ (the percentage change in the quantity of sugar demanded) as the important variable in relation to $X_0$ (the percentage change in price) by putting the other variables $X_2, X_3, \ldots, X_n$ equal to zero, we have examples of the *static* law of demand. "These variables $X_2, X_3, \ldots, X_n$ must be equal to zero since they severally represent *percentage changes,* and the general hypothesis in mind when the static law of demand is formulated is that there shall be no changes in other economic factors."[27]

Though the method of multiple correlation is, as we have just seen, the best method for dealing with the problem of the disturbing factors, it will not be employed in this study. In the case of sugar, we have excellent reasons for believing that the really important disturbing factors which obscure the relation between the prices and the amount of the commodity are not the changes in the prices of glucose, corn sugar, and honey, but the growing popularity of sugar as an article of consumption, the increasing population, and the changes in the general price level. And the effects of these long-time changes may be eliminated by one of two simple statistical devices quite as well as by the method of multiple correlation. These statistical devices, first applied to such problems by Professor Moore, are: (1) the method of relative changes, and (2) the method of trend ratios.

The method of relative changes consists of finding the functional relationship, not between the absolute prices and absolute quantities, but between the *relative change* in the price of the commodity and the *relative change* in the quantity demanded.

> By taking the relative change in the amount of the commodity that is demanded, instead of the absolute quantities, the effects of increasing population are approximately eliminated; and by taking the relative change in the corresponding prices instead of the corresponding absolute prices, the errors due to a fluctuating general price level are partially removed. If the observations should cover the period of a major cycle of prices, and the commodity under investigation should be a staple commodity, . . . . the above method of deriving the demand curve will give an extremely accurate formula summarizing the relation between variations in price and variations in the amount of the commodity that is demanded.[28]

[27] H. L. Moore, *op. cit.*, p. 152.

[28] H. L. Moore, *Economic Cycles,* pp. 69–70.

As a measure of relative change we may take either the *percentage change* in the value from one year to the next or the *ratio* of the given year's value to that of the preceding year (link relatives). In this study, however, we shall use only ratios or link relatives in preference to percentage changes, primarily because the former, unlike the latter, are always positive numbers. This is a great advantage where it is desirable to work with the logarithms of the figures.

The method of trend ratios derives the demand curve, not from the absolute prices and corresponding absolute quantities, but from the *ratios* of these prices and quantities to their respective trends. The *rationale* of this method may be based on the following considerations.

If, during the period when our observations were taken, "all other things" had remained equal as theory demands, we should have no secular trend either of prices or of quantities. The existence of a secular trend in either series is *prima facie* evidence that "all other things" did not remain equal, that there was one or more disturbing factor or element. It is the disturbing elements which give rise to the trend and which create a different "normal" from time to time. Hence it follows that by taking the *ratio* of the actual (observed) prices to normal or trend prices, we eliminate, for all practical purposes, the effect of the long-time disturbing elements on the price of the commodity under consideration. Likewise, by taking the *ratio* of the corresponding quantities to their trend, we eliminate approximately all the long-time disturbing factors influencing the supply. By taking the ratios of our variables to their respective trends we are practically overcoming the chief difficulties which, according to Edgeworth and others, lie in the way of deriving statistical laws of demand. For our data, though extending over a period of years, may, when thus adjusted, be conceived of as representing approximately observations taken at a given point in time—at least for practical purposes.

Though the method of trend ratios is, in general, to be preferred to the method of relative changes or link relatives, on the ground that it gives a more adequate solution of the problems which are faced in the derivation of the static law of

demand, it would be erroneous to assume that it is always superior to the method of link relatives. *All of these statistical devices are to be valued according to their efficacy in enabling us to lay bare the true relationship between the phenomena under consideration.* An *ideal* method would eliminate entirely all of the disturbing factors. We should then obtain *perfect correlation* between changes in the quantity demanded and corresponding changes in price. That is to say, the observations would all lie on the demand curve—there would be no "scatter" of points around the curve. The efficacy of any *practical* method is to be valued according to the closeness with which it meets the ideal or a priori requirements. Judged by this standard, the method of link relatives not infrequently gives better results than the method of trend ratios. At other times, especially when it is necessary to use data which are affected by abnormal conditions, it will be found desirable first to correct the price series by an index number of prices, and the quantity series by the census figures for population, before proceeding to apply any of the other methods.

In the following pages all of these methods, with the exception of the method of multiple correlation, will be applied to the same problem—the derivation of the law of demand for sugar—with the view of testing their relative advantages and disadvantages. More specifically, the law of demand for sugar in the United States will be derived: (*a*) by the method of link relatives (*b*) by the method of trend ratios. Both methods will be applied to the observed or unadjusted data for prices and consumption as well as to data which were first corrected for changes in the general level of prices and for population growth. Attention will also be called to the type of trend which is most suitable for the purpose of the problem in hand and to the type of equation which is most suitable for the purpose of deriving the best value of the coefficient of elasticity.

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[*To be continued*]

# RAILROAD VALUATION AND RATE REGULATION

## I. USUAL SUPERFICIAL TREATMENT OF THE PROBLEM

So-called railroad economics has been for the most part, since the writer of this paper has been in contact with it, largely if not mainly descriptive and justificatory. The railroads have been mapped. Their groupings by ownership have been described. The various types of engines, cars, and rails, in the early years of the railroads and in recent years, have been pictured. The nature of their corporate organization has been detailed. The laws regulating railroads and alleged reasons for the passage of such laws have been discussed at length. Frequently it seems as if economists are defenders of congressional legislation after it has been passed instead of being scientific investigators of the relations involved beforehand, or impartial critics afterward.

To describe at length the "actual practices" of railroads, to explain carefully and, in the main, to justify the actual legislation of Congress, perhaps gives to the economists who do it a pleasant sense of being "practical," of being broad "men of affairs." Nevertheless, such treatment of the problems of transportation and, in particular, such treatment of the problem of transportation rates is just about as creditable as would be like treatment of the problem of protective tariff duties. Indeed, transportation rates, like tariff duties, may operate to turn industry, in various places, out of those lines which can be most effectively carried on there. These rates can even cause some cities to decline in population and industry and other cities, less endowed with natural advantages, to grow. Transportation rates may thus operate to lessen the productive efficiency of a country and to decrease the total output of industry. The various possible influences of this sort, from the general level of rates and from discriminatory practices, should be the principal concern of economists, and not the supposed "practical" details

of railroading, which require no knowledge of fundamental economic principles for their comprehension.

## II. VALUATION AND THE PRICE LEVEL

One of the practical problems to which more or less recondite theoretical considerations ought to be applied is the problem of railroad valuation (or of public-utility valuation in general), and, in particular, whether original investment or present cost of plant duplication should be chiefly considered in arriving at a value for rate-making purposes. Just when it began to seem that commissions and courts were more and more coming to place emphasis on cost of duplication (or, better, on the present cost of construction of a plant capable of rendering the desired service), a number of economists have begun to insist on original investment or original cost as the only proper basis for the regulation of rates.

The first criticism which naturally suggests itself is that to base rates on original money cost, without any qualification, makes both the public and the investors in railroad securities speculators in the value of money and possible victims of chance. Suppose, for example, that the price level should fall, within a short period, by one-half. Then, if the railroads were allowed rates to make the usual percentage on the *original cost,* the public which patronized the railroads would have to pay rates much higher than would suffice to yield the current rate of return on newly constructed plants. These rates, therefore, would not be lower in the proportion in which prices generally were lower. Persons who had invested in other industries would find their returns cut in half, although these returns would be as high a percentage of the likewise-halved cost of plant reproduction. These lowered returns, however, would buy as much at the reduced price level as the higher returns had previously bought, so that there would be, for the investors in the industries as a class, no real loss. But it is proposed that the investors in public-service industries shall occupy a protected position. When all other prices fall by one-half, the rates of such industries and, therefore, the rates of railroads shall be regulated so as to fall by a

much less amount and so as to leave for investors in railroads returns as high as before and returns which, at the reduced price level, will purchase twice as much as before.

What, now, if most of the capital of a railroad (or any other public-service industry) has been supplied by a bond issue? The owners of the bonds are legally entitled to a fixed return, if the business earns it, regardless of changes in the price level. Even if prices should fall to a tenth of their former level, or lower, the amount due yearly to the bondholders would remain unchanged. Therefore, it may be said (and, in effect, it has been said), the rates of railroads "must" be allowed to stay higher than other prices, for even if it is allowable for the stockholders to be wiped out, the bondholders "must not" lose. And it may be further contended, since any loss would fall first and most severely on the stockholders, that no loss ought to be allowed.

But there are a number of important considerations on the other side. In the first place, so far as the bondholders are concerned, a reduction of their returns by one-half when the price level has fallen one-half involves no real loss. It is only a nominal loss. This remains true even if the principal of the debt, as well as the interest, is halved. And to prevent such a nominal loss is to give these bondholders, in effect, a real gain as compared with and at the expense of the rest of the community.

In the second place, although it is true that the stockholders are guarantors of the bondholders and may lose heavily if and when rates fall, nevertheless it is not unreasonable to presume that they took the risk of loss along with the chance of exceptional gain. Why should either the bondholders or the stockholders of a railroad (or other public-service industry) be even indirectly and partially, through a policy of rate regulation, guaranteed a fixed money income regardless of what happens to the general price level, when investors in competitive industries have to take their chances?

If, on the other hand, the price level rises, say by 100 per cent, then a doubled transportation rate, which will yield twice as many dollars on the investment, is no harder for the public to pay and yields no more, in terms of goods, to investors. Twice

as many dollars is the same percentage as before of the reproduction cost, since the reproduction cost has doubled. If the contract between the stockholders and bondholders calls for a fixed return in dollars to the latter, they will, in effect, lose and the stockholders will gain, but the investors as a whole will neither lose nor gain. And surely it is to be doubted whether a practical public policy can base the rates of railroads on the relation of stockholders' to bondholders' contributions toward the construction of railroad plants.[1]

But let us leave aside considerations of justice, as such, and turn our attention for a while to possible effects of the policy of valuation and rate-making on industry. Suppose that the policy is adopted of fixing rates on the basis of original cost, and suppose that the general price level has fallen so that the plant could now be constructed for a fraction of this original cost. Then to keep the rates high enough to yield a reasonable return on this cost is to keep them so high as to discourage commerce which is worth while, which yields a benefit to the community in excess of what would be its present cost to the community, and which ought, in any ordinary economic reckoning, to be allowed to take place.

It is, indeed, often contended, and rightly, that increased traffic can be taken advantageously at less than average rates if the *extra* or *additional* cost incurred thereby is more than covered. Thus, a lower rate may be charged on coal than on brick, though cost of carriage be the same, if only so can the coal (as *extra* traffic) be carried. But here a further issue is raised, viz., that of reducing rates on both brick and coal, when reductions will increase traffic, though not enough to make the lower rates as profitable as the higher, but when these reduced rates are high enough to yield a reasonable rate of return on what it

[1] In view of possible changes in the price level, the fact that railroads have been financed so largely through bond issues is unfortunate. Sinking funds to retire bonds and the financing of new roads and extensions through issues of stock should perhaps be encouraged. But, after all, the one really effective way to get rid of the evils of a fluctuating price level is to stabilize the price level.

would now cost to construct the plant. Under such conditions, to refrain from reducing rates operates to prevent commerce which is economically desirable and which, from the viewpoint of the general welfare, should not be prevented.

On the other hand, if prices greatly rise and rates are based on the number of dollars of original investment in a low-price period, then traffic is encouraged to take place which would not have been encouraged had prices remained stable. Thus a change in the general price level is made to change the relations of other industries to the railroad industry. Unless this would have been desirable had the price level not changed, why should it be desirable when the price level does change?

But it may be contended by someone that these low rates, if they cover the "particular operating costs" or "prime costs" of the business, are advantageous by virtue of encouraging traffic that is worth as much to the community as these costs. But if, the price level having greatly risen, railroad rates should be kept from rising proportionately, in order that traffic may be encouraged; then, had the price level not risen, these rates should be lowered far below the level at which they would yield reasonable returns on investment, in order to encourage traffic. It is very much to be doubted whether such rate regulation would be good public policy. It certainly would be hardly consistent with the policy of dependence, for such public-service industries as railroads, on private capital.

At any rate, looking at the matter from a long-run point of view, there is an obvious objection to having railroad rates lower than will yield a reasonable return on *present* cost of construction, especially if the discrepancy is marked. For such low rates may easily encourage more traffic than existing facilities can care for. But under such circumstances the construction of a new plant (or, perhaps, even new trackage) to care for the surplus traffic at these low rates would not be undertaken. And since the increased traffic may exceed the capacity of the old plant, congestion and the principle of "first come, first served" may bring it about that traffic which is not worth enough to jus-

tify paying high rates will displace traffic which is worth more to the community.[2]

But why not, it may be urged, construct a new railroad (or new trackage on the same railroad) which should carry the overflow freight at rates paying a reasonable percentage on the *present* cost of construction, while part of the freight is carried on the old railroad at much lower rates? Here again, however, difficulties arise. Which freight and whose freight shall be carried at the low rates when all cannot be? Do we not, in our fear that we may permit a railroad to make a return based on the present cost of constructing the necessary plant instead of the old and (in terms of the then dearer money) lower cost—do we not arbitrarily confer a favor, in the form of lower rates and, therefore, larger profits, on some shippers, or arbitrarily give preference to selected goods and so to the shippers or consumers of such goods or to both? And in case an old community has a railroad, not yet congested, with rates based on original cost of construction, while a new community must have rates based on present (or relatively recent) cost, will not there be likely to result an economically undesirable distribution of industry and population?

### III. VALUATION AND CHANGING PRICES OF MATERIALS FOR CONSTRUCTION

Let us suppose now, however, that what has changed is not the general average of prices or price level, but the prices of steel rails, ties, engines, cars, etc., i.e., the things which go into the construction of railway plant. It will still be true that the best basis for regulation is the *present* cost of constructing a plant capable of rendering the desired service rather than the actual past cost of construction of the existing plant.

Let us assume, first, that the cost of construction of the necessary plant is now much less than was the original cost. Then

[2] To those who may suggest that goods which can pay little may be socially better worth carrying than goods which can pay much, e.g., that coal might well be carried at low rates to benefit the poor, the answer is to be made that if wealth is not properly distributed, then the cause of this evil should be dealt with directly, rather than that the burden of correcting such evil should be thrown on the shippers or receivers, as such, of other goods.

to base rates on original cost, so as to make them yield the current rate of return on such cost, is to make them higher than they would be if based on present cost of construction.[3] Although such higher rates might be more profitable than lower rates would be, they would almost certainly cause a decrease of traffic.[4] This potential but prevented traffic would be, in part, traffic worth more to the community than it would cost, under present conditions, to carry it, including interest on the present construction cost of the necessary plant. Therefore, a geographical specialization which would be beneficial to the community is interfered with. The community, through having a railroad built some time ago, may be prevented from enjoying as much geographical division of labor as it could enjoy were it to depend upon a new railroad to be built under present cost conditions.[5] Economic loss is decreed when such a policy is insisted upon.

Here, again, we are confronted with the question why it is necessary to be more tender with investors in railroads or other public-service industries than general competitive conditions are with investors in competitive industries. A fall in the cost of

[3] If the traffic would disappear at such higher rates so that they *could not* be charged, then there is no use discussing the problem of whether they ought to be allowed. The discussion above assumes that the higher rates could be collected and considers merely the problem of whether they should be allowed by the regulating commissions.

[4] If anyone is disposed to argue that whenever a higher rate would decrease traffic a lower one might be charged, the answer is to be made that, with certain exceptions, most of which the writer has attempted to discuss in *Transportation Rates and Their Regulation* (New York: Macmillan, 1916), such a plan is utterly impracticable and would result in a confusion of discrimination. Thus, if a high rate on wheat would leave some farmers still shipping wheat but other farmers, whose land is poorer or who can more easily and profitably turn to other work, not doing so, by what legerdemain shall we pick out for the high rate those whose land is so good or whose alternatives in other work are so poor that they would in any case remain farmers, and for the low rate those who would move off of the railroad line if the rate to them were kept high? Probably few economists would approve an attempt to introduce such discrimination.

[5] No denial is intended, however, of the fact that the existing development of the community may be dependent, in part, on its having had a railroad in the past. It may be well to point out, also, that the "cost conditions" to which attention is here particularly directed have to do with plant construction. For a consideration of the bearing of any possible dependence of expenses of operation, as such, on the age of the plant, see section v of this paper.

construction of the necessary plant for undertaking the manufacture of cotton cloth would tend definitely toward increased competition, lower prices, and reduced per cent returns to those who had constructed their factories when cost of construction was high. There would, indeed, be a lag in this adjustment, perhaps of several years, since time would be required to familiarize potential competitors with the fact of reduced costs as well as to get new factories built. Nevertheless, such reduced costs would operate strongly and within a fairly short time, in the direction of reduced prices of output. And one feels inclined seriously to question whether there is any better way to undertake the regulation of rates of an industry in which competition is not present than to endeavor so to fix these rates that they will yield the same proportionate return as would be yielded in a competitive industry[6] under similar conditions.[7]

But suppose the materials entering into the plant to have risen in price so that the present cost of construction is much higher than the original cost. In that case, any growth of traffic necessitating construction of additional plant would practically require[8] rates high enough to yield a return on this higher present cost of construction. The various alternatives among which choice would have to be made would be: (*a*) to keep rates low, not construct needed additional facilities, and thus artificially check the development of traffic and of geographical division of labor which might be worth much more than its cost, (*b*) to keep rates low on the old railroad while allowing them to be high on a new railroad, so discriminating between shippers, and (*c*) to base the rates of any or all the railroads on the present cost of railroad plant construction. It is perhaps hardly necessary to say that the last is the policy which the writer believes to be wise. In a competitive industry, higher present cost of construction would discourage competition, limit the supply of the article

[6] Cf. the writer's book, *Economic Science and the Common Welfare* (Columbia, Mo.: Lucas Brothers, 1923), pp. 38–39.

[7] This, of course, implies that due allowance will be made for difference of risk, if any.

[8] We are assuming here, dependence on private investment for new construction.

or articles produced, raise prices, and enable those who had constructed their plants when the necessary materials were cheap to make more money. Is there any sufficient reason why a like result should be prevented in a monopolistic industry, when the consequences of such prevention are likely to be as has been herein indicated? Here, too, as when we were discussing changes in the general price level, it may be pointed out that rates in one part of the country based on original cost and rates in another part based on cost of duplication may operate to keep or drive industry away from those very sections where it could most economically be carried on.

### IV. THE UNEARNED INCREMENT AND VALUATION

But the advocates of fixing rates on the basis of original cost rather than that of present cost of construction sometimes present another, though a related, argument which, some of them seem to think, is the strongest argument of all. This argument runs to the effect that to fix rates on the basis of original cost of construction would free the public from the necessity of paying a return on the unearned increment of land values. Liberals and radicals, and conservatives, frequently take sides on a specific question, without much reference to fundamental economic principles, according to the temporary interests or supposed interests of the masses or the common people on the one hand, and of the well-to-do or of large corporations as such on the other hand. Hence, when the cost of construction of the plant necessary to render a given service is less than the original cost of existing plant, we may expect to find—as we do find—that persons on the "liberal" or "popular" side of the question of rate regulation will favor putting emphasis on present cost. But when inflation or rise of land values brings it about that present physical value is far in excess of original investment, then persons of "liberal" sympathies lean toward original investment as the proper basis of valuation for rate-regulating purposes.

We, however, cannot lightly espouse any class "cause," but must search for a principle of general applicability. To the proposal that rates should be made so low as to prevent railroads

from getting any return whatever on any increased value of their land, but only a return on its original cost to them, there is an important, and it should be an obvious, objection. This is that if persons in all competitive lines of business are permitted to enjoy the so-called unearned increment of land when population increases, while investors in railroads are allowed no such gain, then there will be a tendency to discourage the building of railroads. For we then say, in effect, to the owners of land: If you use your land for any other purpose, you may enjoy any unearned increment that the growth of population happens to bring; but if you use your land for the building of a railroad, you shall not be permitted to enjoy such unearned increment. Is it not to be expected that, under such conditions, the building of railroads would be discouraged?[9]

But let us look at the matter from a slightly different angle. If the unearned increment can be enjoyed on land used in other ways but not on railroad land, then, it may be, the price which prospective builders of railroads are able to offer for land will tend to be less relatively to the price which can be offered for land by persons intending to use it in other ways. This condition will operate to discourage railroad building. People will not be anxious to sell their land for a lower price to a railroad company than they can get from individuals or corporations planning to use the land otherwise, nor will they usually be compelled to sell their land thus low when condemnation proceedings are started under the law of eminent domain.

[9] Some railroads might, of course, still be constructed. Thus, owners of adjoining land might contribute to the building of a railroad through or past their land, just as they may sometimes now do so, even though they expect little return from the railroad itself, for the sake of possible increased value of their adjoining land. Nevertheless, the rate-regulating policy in question would certainly tend to discourage railroad building. It might thus cause industry to develop more largely along other lines and less largely in transportation than it otherwise would or than would be best for efficient wealth production. (See, however, the author's book on *The Economics of Taxation* [New York: Holt, 1924], pp. 228–30, where it is pointed out that the lure of increased value of adjacent land may sometimes cause construction of railroads which, from the point of view of the whole public, are economically not worth constructing. If the unearned increment were not received in *any* line, then, in the main, the tendency would be for those industries to be most developed which were most desired by the public.)

All this does not mean that railroads should be allowed to enjoy the unearned increment. Nor does it mean that they should be allowed to enjoy, as corporate income, any considerable proportion of the economic rent of their land. It is the writer's opinion that the general welfare would be furthered by gradually changing our system of taxation so as to take in taxation, for public purposes, more and more of the annual rental value of land and so as to reduce greatly other taxes. If this policy were adopted, the salable value of land would decline, for its salable value is a function of the expected rental yield to the owner. Railroad companies, along with corporations and individuals engaged in other lines of business, would realize as high per cent returns as now on the salable value of their land, since the land would be cheaper by as much as the rental yield was reduced. Indeed, they might realize higher per cent returns, since the other elements of their incomes could be less taxed, or not taxed at all. But while it might be a desirable social policy, as the writer believes it would be, to appropriate most of the rental value of land—i.e., of all land having a rental value, however used or even if not used—in taxation, it does not at all follow that we should discriminate between industries, telling people that they can enjoy an unearned increment if they use their land for some purposes but that they will not be allowed to enjoy it if they use their land for other purposes. The result of such hedging, sidestepping, and evasion, by economists, of the real issue regarding economic rent is that economists who may imagine themselves to be "liberal" come to be advocates of policies which are almost certain to involve economic waste, and contribute not at all to the general understanding of what is properly the real problem to be solved.

Those, however, who advocate regulating the rates of railroads on the basis of original cost so as to prevent the realization by railroad companies of an unearned increment are not always even consistent. For when it occurs to them that to give all other interests a chance to get an unearned increment, and not to give the railways any chance to get it, might be discrimination against railways as such and might even discourage railroad

building, then they propose to compensate railroads for this deprivation. Specifically, what they propose is so to regulate rates as to assure the railroads a fairly high average return, high enough to make up for possible deprivation of the unearned increment. In other words, it is proposed that the rates allowed in the early years of a railroad shall be higher and the net return on investment greater to compensate railroad investors for having the land value on which they are allowed to make a return valued at a constant original-cost figure instead of being valued at successively higher figures with the growth of population. In still other words, it is proposed that railroad rates shall be higher (in a growing country where land values tend to increase) than they would otherwise be during the early history of a railroad, and that later they shall be lower than they would otherwise be. The higher rate of return permitted on investment will make the rates higher at the start; but the refusal to count as part of the value of the railroad, on which earnings are allowed, the unearned increment of land, will make the rates lower, as a rule, later, although higher in those exceptional cases where the value of the land declines.

Let us investigate the merits of this proposed policy by inquiring into its probable consequences. To begin with, we may note that the allowing of a higher per cent return at the beginning will tend to discourage trade and, therefore, will tend to discourage the fullest geographical division of labor. Traffic which is worth taking, which is advantageous enough to the community to more than offset its cost, which can pay a rate capable of yielding (allowing for differences of risk in different industries) the current rate of return on investment, is discouraged and decreased because of an attempt to get more than the current rate of return. This involves loss (despite the larger returns on railroad investment) to the community's productive efficiency.

But as time goes on the community develops and the value of the railroad land (terminals and right of way) goes up. The railroad land, along with other land, comes to have a higher potential yield and so to have a higher salable value. Land along the railroad is worth more for other uses than it was. Even some

of the land used by the railroad may be worth more for other uses, because of community development and the growth of population. To keep the land from these other uses is hardly justifiable economically unless the land is equally useful for railroad purposes. But how shall we test its usefulness for railroad purposes better than by the willingness of the public to pay rates for the transportation of their goods, rates high enough to yield the current rate of return upon what the value of the land would be—or upon what the value of adjacent land is—for other purposes? May it not involve economic waste to use land for extra trackage and terminals in order to carry traffic which cannot pay such rates?

But suppose the community grows and a second railroad is required which, though following a different route and needing its own right of way, connects the same terminals. The second railroad has to pay more for land, because of the rise in land value, than the first one paid. If the rates are to be fixed so as not to yield a fair return on what the land is now worth, then the second railroad, though needed, may not be built, and geographical division of labor which is worth much more than its cost may not be permitted to develop.

If, however, the alternative chosen is to allow rates on the new railroad to be sufficiently high so that its construction is profitable, but to keep rates on the old railroad low, then we shall find ourselves confronted with an arbitrary discrimination between shippers. In our fear of letting the earlier-built railroad enjoy an unearned increment, we transfer the gain to a favored group of shippers. Those who can ship by the earlier-built railroad pay low rates. But those who, because the low-rate road cannot carry all the traffic, have to ship by the other railroad are compelled to pay high rates.[10]

Discrimination between places may also make its appear-

[10] Although there is here an element of special privilege, it cannot be said that the shippers on the low-rate railroad will be able to drive the others from the field. For, by hypothesis, this railroad cannot carry all the traffic, consumers cannot be satisfied except as goods are produced which have to be shipped over the newer railroad, and the prices of these goods must be sufficient to keep the producers of them in business. But at these prices the favored shippers reap an extra gain.

ance if the policy of fixing valuation, and therefore rates, on the basis of original cost is insisted on. By this system, as we have seen, rates would have to be higher on the second railroad than on the first. This would mean that towns on the second railroad would be relatively hindered in their development even although various kinds of business could be carried on to better advantage in them than in towns on the first railroad. People would tend to locate their industries in (or to remain in, if already there) the towns located on the first railroad, so long as the traffic did not exceed what this railroad could carry, even although water power or other natural advantages made a relatively greater development of industry along the line of the second railroad best for the community's economic efficiency or wealth-producing power.

In short, however we look at the matter, a failure to regulate the rates of railroads with due regard for the present cost of plant construction seems likely to lead to economically undesirable consequences. Taxation can be made to secure for the public as much of the economic rent and unearned increment as the public desires to get. Rate regulation to accomplish such a purpose may involve very considerable economic waste. At best it substitutes one group of privileged persons for another. It does not transfer the unearned increment to the whole public. One finds it hard to avoid the impression that many economists are ready to support any kind of foolish paternalistic tinkering in special industries rather than to face frankly the problem of the economic rent of land in general.

But a further possible result of attempting to fix rates on the basis of original cost, and so ignoring changes in land values, needs to be considered. Suppose that instead of an increase of population in a given community, and a rise in land values, there should happen to be a decrease of population and business and a fall in land values. Under such circumstances, if it is still insisted that rates shall be based on original cost, rates must be kept high even although such high rates cause further declines in population and decrease of traffic, so long as these high rates are, on the average, more profitable than reduced rates

would be. Even if, finally, over a long period, these high rates completely destroy traffic, they may yet come nearer yielding a return on *original* cost than lower rates would do. For the temporarily larger earnings before traffic disappears, plus interest on these earnings, may more than make up for the later disappearance of earnings. But the community is injured. It may be that, were a new railroad constructed at the lower cost which has become possible because of the decreased value of the land, this new railroad could make a reasonable return on its investment by charging rates low enough to maintain geographical division of labor, to keep the community in question reasonably prosperous, and to prevent continued decline in the population and industry of the community. But if the community must pay rates intended to yield the customary per cent return upon the original cost of the long-ago-constructed railroad, then geographical division of labor which is well worth its present cost will be discouraged, industries which might be able to yield a reasonable return on the present or reproduction costs of *their* plants will languish and die, population will be driven away even although a considerable part of it could more profitably remain, and the net result will be economic waste, lessened wealth-producing efficiency, and loss to the nation as a whole.

Before concluding this section it may be well to examine an alleged difficulty. It is sometimes said that present cost of construction is ambiguous so far as land is concerned, because the value of the land is affected by the presence of the railroad. Hence the question is raised whether the land shall be valued at what it is worth with the railroad present or as what it would be worth with the railroad absent. This difficulty ought not to seem so grave to economists who are familiar with the marginal analysis. We might think of the railroad as being constructed by successive increments and then ask what the value of the land would be in case everything were present but the last small increment of construction—the last switch, station, or station platform space. In truth, the value of the land is a function of natural conditions, and of social growth and development in general, including mining, agriculture, manufacturing, trade,

and transportation. The railroads are only a part of the story, and one railroad is frequently only a part of a part. If it be true —as it is not wholly true, least of all in view of the wide extent of water transportation and transportation by auto-truck—that the development of other industries depends on the railroads, it is no less true that the success of the railroads depends on the development of these other industries. If returns in these other industries are measured by and dependent on the present cost of construction of the necessary plants, and, therefore, the present value of the land, as they must be in view of what new competitors can buy and construct for, why should not the present value of the land, i.e., what it is worth with the railroad or railroads and all other industries at their current development, be emphasized in railroad valuation for purposes of rate regulation?

### V. DEPRECIATION, OBSOLESCENCE, AND ACCOUNTING

A practical objection sometimes raised to the proposition that valuation ought to be on the basis of present cost is that the present cost (of duplication) cannot be ascertained except by a long and costly engineering investigation; while the original cost, including additions and improvements, is, assuming a proper accounting system, a matter of record. Doubtless there is some merit in this contention, and there is here no intention to deny that records, properly kept, may be of great help in valuation for rate-making purposes. Over short periods, indeed, it may sometimes be well to rely almost exclusively on such records. Nevertheless, there is danger that the current cost of plant construction may come to diverge widely from the original cost, and when this is the case, current cost ought by all means to be considered. The records on original investment should never be regarded, therefore, as more than prima facie evidence, subject to modification whenever there is reason to believe that present cost of duplication would be widely different.

This brings us to the problem of depreciation and obsolescence. We have discussed valuation so far as if the proper basis were what it would now cost to construct a plant capable of

rendering the desired service. We have made no allowance for depreciation and obsolescence. Yet an old plant is likely to be one which requires more expenditures for repairs, and the time may be near when, if service is to be continuous, renewal or partial renewal of plant will be necessary. If the plant of a railroad (or other public utility) is so far depreciated as to be fairly worth only (say) half as much as a new plant would be worth, it does not seem fair to the public to allow rates high enough to yield the current per cent return on the value of a new plant. On the other hand, as a plant becomes older the annual expense for repairs may grow so that a rate which, when the plant was new, would have yielded a considerable return on a large investment now yields a fair return only upon a smaller value. In any case, assuming no change in the price level, population, and land values, or other general conditions, one is inclined to the view that rates should remain constant during the life of a plant. For there seems no special reason why the main burden of paying for depreciation and interest on the plant should be borne by the users of it during its earlier years, nor any special reason why this burden should be borne chiefly by the users of it during its later years. We have shown, in preceding pages, why changes in cost of construction of plant may justify higher or lower rates later than earlier, but we have shown no reasons for such higher or lower rates in the absence of such changes in cost of construction. Other things equal, constancy of rates seems to be the indicated solution.

But constancy of returns on investment, at least after an initial period of building up patronage, is also desirable. The question therefore arises whether constancy of returns, in view of declining value of plant and (probably) increasing repair costs, are consistent with constancy of rates. The position here taken is that there need be no inconsistency. For consistency can be attained through the medium of a properly graduated depreciation fund. How this fund should be graduated, i.e., how much should be put in each year compared to the amount put in each other year, would have to be empirically determined for each case on the basis of the probable rate of depreciation and

obsolescence, with, therefore, due regard to the approach of a period of relatively high repair costs.

The rate or rates that a railroad (or other public utility) should be allowed to charge ought to be such as, with reasonable efficiency of management, will yield during the life of the plant enough to meet repair costs, replace the plant (or parts of it) when it becomes worn out or obsolete, and yield a fair return on its cost. In general, during the early years of a public utility when the repair costs are low, this rate should yield a return considerably in excess of a reasonable percentage on investment, and this excess should go into a depreciation fund.[11] As the period of high repair costs is reached, the net returns from operation will decline, but this decline will be offset by the income from the invested depreciation fund. The amount put into this fund each year should be such as will leave a constant annual sum (assuming no new or additional investment) for dividends, and such as will exactly match, by the increase of the depreciation fund, the decreased value of the plant. Thus, in the absence of changes in the price level, in the prices of materials for plant construction, and in the value of land, there will be a constant charge to the public, a constant net return to the investors,[12] and a constant value for the total property of the company.[13]

## VI. THE PROBLEM OF "WEAK" AND "STRONG" RAILROADS

It has lately become the fashion among economists specializing in railway transportation to lament the difference between

[11] In the earliest years, while patronage is growing, it may sometimes be necessary for investors to be satisfied with a very small yield, not because rates are low, but because there cannot at once be developed business enough fully to utilize a plant of the size that will soon be necessary. Under these circumstances, it may frequently be fair to regard the early deficiency of return as added to the total cost of construction, or duplication, on which later earnings shall be calculated.

[12] After a possible initial period of development of business up to plant capacity. See footnote 11.

[13] This result might sometimes be accomplished by investing the depreciation fund in additional plant so that, instead of an entirely new plant, there would be eventually a plant mostly not new but larger.

"weak" and "strong" roads and to say much about the alleged difficulty of fixing a rate structure satisfactorily applicable to both. The desideratum is supposed to be to make the "weak" roads reasonably profitable while keeping the "strong" roads from being too profitable. Ordinarily, no difficulty is alleged to stand in the way of the desired solution when the "weak" and "strong" roads serve entirely different communities. The apparent solution in that case is to lower the rates on the "strong" road (if its "strength" is due to dense environing population, level roadbed, and other favoring conditions, rather than to unusual efficiency of operation) and to raise the rates on the "weak" road. Unless effective wealth production is to be hindered, business should be encouraged to locate where conditions are, in general, most favorable. So far as natural resources advantageous for business, or relative undercrowding of available land and resources, offset the higher costs of transportation along the lines of the "weak" road, it is desirable that business should locate there. But if the real cost of transportation is higher, the rate should be higher, in order that business should not be encouraged to locate on such a road to a greater degree than social economy justifies. Any scheme of consolidation of the "strong" and the "weak" roads advocated on the assumption that higher earnings of the "strong" part of the consolidation are going to offset lower earnings on the "weak" part so as to permit low rates on the latter, is a scheme for an indirect bounty from the more favored regions to encourage the business development of the less favored, and the adoption of such a scheme is likely to bring about economic waste and loss.

But this very sort of policy seems to be desired by some present-day writers, when the "weak" and the" strong" roads are in the same general territory and connect some of the same points. In order adequately to analyze the argument for such a policy, we shall consider it under two possible cases.

The first case is that where there are two railroads between (say) *A* and *B* (see Fig. 1), but one of these, the railroad *ADEB*, is longer or otherwise more expensive than the other, and where the railroad having the cheaper route, *ACB*, could, at least by

constructing additional trackage, carry all the traffic between *A* and *B*. In that case, unless *A* and *B* are to be hindered in that development which will presumably promote the largest wealth production, unless a worth-while geographical division of labor is to be retarded, these towns or cities must have, from one to the other, rates as low as the railroad *ACB* can make consistent with a reasonable return on investment and with no slightest discrimination against intermediate points. The railroad *ADEB* may be allowed to meet such rates between *A* and *B*, if they

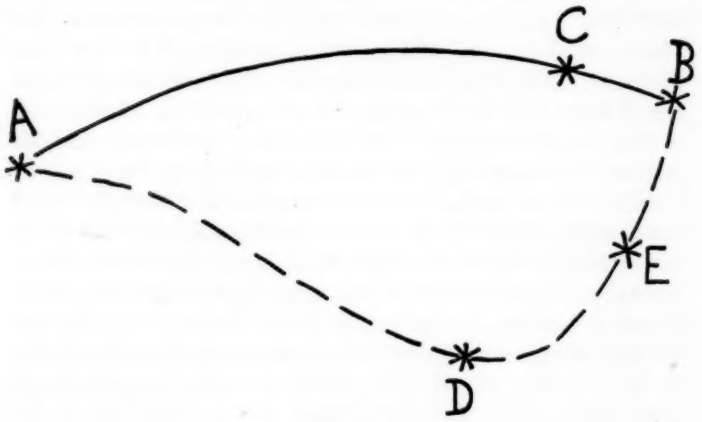


FIG. 1

cover the "particular operating" or "prime" costs of carrying, on that railroad, for thus the road *ADEB* is more fully utilized and the capital which might have to be devoted to additional trackage over *ACB* can be turned to other purposes. This does not mean real discrimination against *D* and *E*. Their rates are no higher than they would be in any case. And the rates between *A* and *B* are no lower than those which they could get, and should get, did the road *ADEB* not exist.[14]

But these rates will not be especially profitable to the road

[14] For a more extended presentation of the writer's views on railroad rate discrimination, see *Transportation Rates and Their Regulation* (New York: Macmillan, 1916).

*ADEB*, which, to cover its general expenses and fixed charges, or to get a normal return on investment, will have to rely chiefly upon the intermediate traffic, *A* to *D*, *D* to *B*, *D* to *E*, etc. Since the railroad *ACB* is the cheaper route for carrying from *A* to *B*, the other railroad, *ADEB*, must be supposed to have been built primarily for the intermediate traffic. It follows the more expensive route *for the sake of* that intermediate traffic. To construct such a railroad would be uneconomical unless it is going to be sufficiently worth while for the intermediate points on it to justify the incident additional expenses, and whether it is so worth while can probably be best determined by the ability or inability, the willingness or unwillingness, of the intermediate towns on its line to pay rates high enough to justify its construction despite the comparative unprofitableness, to it, of the through rates from *A* to *B* and *B* to *A* which are profitable to the cheaper road. If the intermediate towns cannot pay such rates, then the railroad, supposing it to have been constructed, is a "weak" road. And to raise the rates from *A* to *B* on both roads, so as to strengthen the "weak" road and enable it to keep down its rates to intermediate points, will enable these points to develop beyond what their natural advantages would otherwise make possible and will retard the development of *A* and *B*. It amounts to the compulsory payment of a bounty by the industries of *A* and *B* for the building up of *D* and *E*. It tends to drive population and industry away from *A* and *B*, between which goods can be and should be carried cheaply, because the rates are so kept artificially high, and to locate industry at places which, were it not for this artificial injury to *A* and *B*, would be less desirable places for such industry. It tends to weaken the country's effective power of wealth production.

Obviously, the evil in question is no less if the rates so established are fixed under the cloak of railroad consolidation. To consolidate a "weak" road and a "strong" road when the former is making small returns because it is not worth enough to the intermediate points to have justified its construction, and then to make up for this by charging high rates on what was the "strong" road, so interfering with the development of *A* and *B*,

is economically unwise. But the net returns so realized on the combined system would presumably be only a reasonable rate on the cost of duplication of the entire (consolidated) plant.

Unfortunately, our present Transportation Act, as amended in 1920, operates to encourage this very thing. Indeed, it may even serve to keep in operation a railroad which not only ought never to have been built, but which, having been built, *ought to be abandoned*. For it provides that successful railroads, even although their large returns are due solely to efficient management, must pay over to a fund controlled by the Interstate Commerce Commission half of all their surplus earnings above 6 per cent on their "value." Hence, if the "strong" railroad is making such a surplus, it has a motive for taking over the "weak" one, even for purchasing it at some price far above the value of its plant as old iron, etc., notwithstanding the "weak" road yields no returns whatever (or even if it suffers an annual operating loss) and ought, on economic grounds, to be abandoned. That is, the "strong" road has a motive for purchasing the "weak" one, if thereby it can have the reproduction value of the latter, minus depreciation, counted as part of the total value on which it is permitted to make returns. Thus a railroad which ought to be abandoned may be kept in operation in order that another railroad shall not be deprived of a part of the reward of its efficient management. And in the same manner the building of a branch line, really not worth building, may possibly, sometimes, be encouraged.[15] And thus, also, if the income of the "strong" road is high because its rates are unreasonable, it may be able

[15] Suppose, for example, a railroad valued at $100,000,000 and earning $10,000,000, of which $2,000,000 goes to the fund controlled by the Interstate Commerce Commission, leaving $8,000,000 (6 per cent + ½ of the remaining 4 per cent) to the railroad. Suppose, also, that a branch line can be constructed at a cost of $50,000,000 which would yield (it is estimated) $2,000,000 a year or 4 per cent, but that this would not be quite enough to justify its construction. Nevertheless, it might be constructed because of the artificial encouragement given by the Transportation Act of 1920. For the railroad would then earn (presumably) $12,000,000, of which (at 6 per cent on the enlarged investment plus ½ of the remainder), it would be allowed $10,500,000, or $2,500,000 more than if the branch were not constructed. In short, though the branch earned only 4 per cent on cost, it would net the railroad owners 5 per cent.

to make its earnings appear so small that the unreasonableness of its rates between *A* and *B* will be overlooked. But the same profit-limiting policy may discourage the building of new and independent lines. For investors have to take the risk of loss in case the construction of the railroad proves to have been a mistake, while, if it is needed, half of all they make over 6 per cent will be taken from them.

A somewhat different situation confronts us in case the railroad *ACB* runs through gorges or through a narrow valley, so that increased trackage over its route is impossible, and in case it cannot carry all the traffic. Under such circumstances, the railroad *ADEB* is required, not for intermediate traffic alone, but, as well, to handle the overflow traffic from *A* to *B* and from *B* to *A*. Since the railroad *ADEB* is required for this overflow traffic and is not merely doing work that the direct line could do cheaply by further construction, *A* and *B* cannot expect to have such low rates as the direct line could afford to charge. They must expect to pay rates which will contribute proportionately toward the general expenses and the interest on the value of the railroad *ADEB,* and not merely a trifle more than the particular operating costs. Since the more expensive railroad is really needed for this traffic, the cities *A* and *B* must expect to pay their full share of its overhead expenses and net returns, and they cannot complain that in doing so they are contributing a bounty to intermediate towns and are losing the natural advantages of their location. The through rates on *ADEB* must be proportionately as high as the intermediate rates.[16] Otherwise *A* and *B* will grow at the expense of *D* and *E,* to the economic loss of the country.

The rates between *A* and *B* on the railroad *ACB* should be as high as the rates between *A* and *B* on the railroad *ADEB*. This will not prevent trade which is worth while, for the volume of traffic which can be carried over this cheaper route is limited in any case, and the overflow must be carried by the other road

[16] This statement should be somewhat qualified. Allowance has to be made, of course, for the fact that *terminal* expenses do not increase in proportion to distance.

at high rates. To have the railroad *ACB* charge low rates while *ADEB* charges high rates merely passes on to favored shippers the privilege of getting larger returns. All shippers cannot use the railroad *ACB* for all of their business, since it cannot carry all of the traffic. If some use this railroad at low rates while others have to use the railroad *ADEB* and pay high rates, there is an element of special privilege involved which many will not approve. But if all pay low rates, then *A* and *B* are favored at the expense of other points and the effectiveness of national wealth production is diminished. And if all pay high rates, then the railroad *ACB* gets an exceptional return (in relation to the cost of capital construction, including what the land would be worth for any other purpose) consequent on its control over the best situation. This return is economic rent.[17] Rate regulation cannot give this economic rent to the whole community. Taxation can.[18]

Nevertheless, we must expect that persons to whose sentiments the receipt of this economic rent by privileged shippers in the form of reduced rates would be abhorrent will feel its receipt by the owners of the favorably situated railroad to be a very different matter. And we must also expect that if and when such persons propose to do anything at all, they will not dream of gradually increasing the tax on the economic rent of land in general, but that they will defend, and think themselves wise in defending, a policy the application of which would take away a part of the reward of superior efficiency, would bring about an uneconomical encouragement of industrial development in some places and discouragement of it in others, and might even keep in operation railroads which ought to be abandoned or cause the building of railroads which would not be worth their cost.

Apparently many professional economists are ready to dodge

[17] All economic rent tends to be capitalized into salable value. If the railroad is to be allowed to enjoy this rent perpetually, then it will be capitalized into the value of the gorge-confined right of way. Land which would be for any other purpose almost useless may have high value because it provides space for a railroad line and because this space is limited.

[18] See the writer's book on *The Taxation of Unearned Incomes*, 2d edition (Columbia, Mo.: Lucas Brothers, 1925), pp. 37–38.

into almost any corner and to uphold almost any theory, no matter how bizarre, to avoid saying anything which might seem to favor increase of land-value taxation. Such professional economists, and editors of so-called "liberal" magazines, will talk or write glibly about "economic surpluses" and about ways of securing them for the public, but will avoid distinguishing among surpluses which result from superior efficiency, surpluses which are the gains of monopoly, and surpluses in the form of economic rent. And in failing to make these distinctions they necessarily fail to distinguish among surpluses which are a stimulus to efficiency and the taking away of which from their recipients may discourage efficient production, surpluses which, being the extortions of monopoly, should be dealt with by the method of dissolution or by the method of rate regulation, and surpluses which, being due to natural or community-made advantages, can only be dealt with (certainly so long as we keep the individualistic competitive system of business) by taxation.

One expects to discover confusion on economic concepts and principles in the minds of statesmen and publicists. And one expects to find elective officers and legislators generally following, rather than leading, public opinion, because the public tends to choose for high office men whose opinions on matters of great common and conscious interest do not greatly differ from its own. Indeed, an intelligence on such matters greatly superior to that of the electorate, coupled with frankness in expressing the opinions to which such intelligence has led them, may often be an insuperable bar to political preferment. But of professional economists, on their specialties, we have a right to expect—though we shall often expect in vain—intelligence, freedom from current prejudices, and frankness. The honor of the craft of economists will be best assured if they always boldly prophesy the truth as they, in a spirit of detachment, are able to see it, even if, like Homer's Cassandra, they are never believed. Surely they ought not to be the means of confirming the masses in wrong and prejudiced conclusions or, even less, of leading the masses yet farther astray. But this, unfortunately, is what they sometimes do.

## VII. SUMMARY AND CONCLUSION

Perhaps it may be well, in bringing this discussion to a close, briefly to recall the principal problems which have concerned us and the principal conclusions reached. We considered, first, the question whether original investment or present cost of duplication should be chiefly considered in valuing railroads (or other public utilities) for the purpose of rate regulation. It appeared that whether the divergence between original investment and present cost is due to changes in the general price level, to changes in the specific prices of materials required for construction, or to changes in the value of land, in any case economic waste and loss would be likely to be produced by emphasis on original cost rather than cost of duplication. If there is objection to the private enjoyment of the unearned increment, this should be handled by taxation applying to land used for all industries rather than by regulation of the prices or rates of one industry. A properly graduated depreciation fund, it was thought, ought to provide against depreciation and obsolescence. From a study of the valuation of railroads we were naturally led into a consideration of the problem of "weak" and "strong" roads. We concluded that rates should not be kept artificially high on roads which could well afford to charge low rates, in order that other roads could pay better or in order that intermediate towns on these other roads might be developed. And railroad consolidation for the purpose of achieving such an end we were unable to approve. But if a "strong" road, because of running through a narrow gorge or valley, could not carry all the traffic, and if, therefore, another road was required, then rates might fairly be fixed on the basis of valuation and cost on the more expensive railroad. In that case the owners of the cheaper route would get situation rent. Rate regulation merely changes the persons who are privileged to receive this rent. Only by taxation can it be secured for the whole public.

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## THE RETIREMENT OF NATIONAL BANK NOTES

Under the provisions of the National Bank Act, prior to the passage of the Federal Reserve Act, all national banks were required as a condition of doing business to maintain a minimum amount of United States Government bonds with the Treasurer of the United States, against which circulating notes might be issued. This provision had had its origin principally in the desire of the government to provide a market for its bonds during the Civil War. The actual amount of bonds to be kept on deposit had been changed from time to time by amendments, but when the Federal Reserve Act was passed in 1913 the provisions were that national banks having a capital of over $150,000 were required to deposit bonds for circulation to an amount not less than $50,000, and banks having a capital of $150,000 or less were required to keep on deposit bonds equal to one-fourth of their capital stock. A national bank was entitled to receive and issue circulating notes equal to the par value of the bonds deposited with the Treasurer, but not exceeding the amount of the bank's paid-in capital stock. In addition to the bonds on deposit a bank taking out circulation had to keep with the Treasurer of the United States a redemption fund in lawful money equal to 5 per cent of its notes in circulation.

The unsatisfactory character of national bank notes, due principally to their inadequate elasticity, had long been recognized by students of banking, and for some years prior to the passage of the Federal Reserve Act practically every plan advanced for currency or banking reform contained as an important factor some provisions for getting rid of these notes. In the Federal Reserve Act itself such provisions are to be found in sections 17 and 18.

In the first place, section 17 repealed those provisions of the National Bank Act which required that before any national bank should be authorized to commerce banking business it

should deposit with the Treasurer of the United States a stated amount of United States registered bonds. There was at first some ambiguity about the meaning of this section, but the amendment of June 21, 1917, makes it clear that since that time the amount of United States bonds bearing the circulation privilege that each national bank may deposit with the Treasurer as a basis for note issue is entirely discretionary. Any bank is free to take out no circulation at all or up to the full amount of its paid-in capital stock.

In the second place, section 18 contains provisions whereby national banks, desiring to retire circulation, may sell the bonds serving as security to the Federal Reserve banks at par. Applications for sale must be made through the Treasurer of the United States, and the Federal Reserve Board, in its discretion, may require the reserve banks to purchase such bonds to the extent of $25,000,000 a year. The purpose of this provision was to enable national banks to avoid loss on the sale of the 2 per cent bonds which formed the principal security back of national bank notes,[1] and whose market price had been artificially enhanced through their availability for this purpose. The bonds thus purchased may either be used by the Reserve banks as security for note-issues of their own, the so-called Federal Reserve bank notes, or, at the discretion of each Reserve bank, they may be converted into 3 per cent government obligations not having the privilege of serving as security for circulation. As such conversions take place there will be a gradual contraction of the basis of note circulation.

In the third place, it is important to note that in addition to the bonds that may be purchased through the Treasurer of the United States as required by the Federal Reserve Board, the Reserve banks are free, according to the rulings of the Board, to purchase such bonds in the open market without limitation. Moreover, it appears that there is no restriction upon the power

[1] On October 31, 1913, $685,966,190 of the 2 per cent bonds out of a total of $730,882,130 outstanding were on deposit with the Treasurer of the United States to secure national bank circulation.

of the Secretary of the Treasury to convert the bonds thus purchased into three per cent securities without the circulation privilege.[2] It is obvious that these voluntary open market purchases open up the possibility of a much more rapid retirement of circulation than could take place under the compulsory purchases, limited to $25,000,000 annually, as provided for in section 18.

The Federal Reserve Act has now been in operation over ten years. What has been the actual course of retirement during these years and what are the possibilities of retirement in the future? It is the purpose of this article to analyze the factors involved in the answers to these questions.

## ACTUAL COURSE OF RETIREMENT UNDER THE FEDERAL RESERVE ACT

From an examination of the statistics of national bank circulation it is apparent that the Federal Reserve Act has not achieved its purpose of getting rid of the national bank note. As a matter of fact, the volume of circulation at the end of 1924 was even larger than it was at the time of the passage of the Act. On January 1, 1914, the amount outstanding was $757,842,961, while on January 2, 1925, it was $772,318,867. As a result of the issue of emergency currency during the crisis of 1914 the total national bank circulation rose to a maximum of $1,126,039,600 in the middle of November, 1914.[3] It fell rapidly while the emergency currency was being retired up to January, 1916, and continued to decline after this at a slower rate until it reached a figure as low as $715,420,010 on July 1, 1917. Throughout the period from the beginning of 1917 to the middle of 1921, it remained close to $725,000,000, fluctuating slightly above and below that figure. After the later date an upward movement in circulation began, which continued with slight interruptions to the end of 1924, when the volume outstanding was over $770,000,000.

[2] See *Federal Reserve Bulletin*, April 1, 1916, p. 151.

[3] This article is concerned with the bond-secured circulation, so that no attempt is made to consider the factors involved in the issue of emergency currency under the Aldrich-Vreeland Act.

The history of national bank circulation since the passage of the Federal Reserve Act may be divided into four periods: (1) the conversion period, from the inauguration of the Federal Reserve System to our entrance into the war in April, 1917; (2) the war period, from April, 1917 to the end of 1920; (3) the high bond-price period, from the end of 1920 to February 2, 1925; (4) the bond redemption period, beginning February 2, 1925.

*The conversion period.*—Up to the time of our entrance into the world-war the purchase by Federal Reserve banks of United States bonds having the circulation privilege and the conversion

TABLE I

PURCHASES AND CONVERSIONS OF UNITED STATES 2 PER CENT BONDS BY FEDERAL RESERVE BANKS, 1914–1917*

| Year | Purchases | Converted into 3 per cent Securities |
|---|---|---|
| 1914 | $ 175,000 | ..... |
| 1915 | 11,776,350 | ..... |
| 1916 | 48,128,100 | $30,000,000 |
| 1917 | 13,997,200 | 26,256,500 |
| Total | $74,076,650 | $56,256,500 |

* *Annual Reports of the Federal Reserve Board.*

of these bonds into 3 per cent securities without that privilege was proceeding at a fairly rapid rate. At the same time the volume of bond-secured circulation was declining as contemplated by the framers of the Federal Reserve Act.[4] The annual purchases and conversions during this period are shown in Table I.

The total purchases by the Reserve banks of bonds with the circulation privilege were $74,076,650 and of these, $56,256,500 were converted into securities without the circulation privilege. Of these purchases only $10,877,500, however, were made under the provisions of section 18, that is, through the Treasurer of the United States, as directed by the Federal Reserve Board. All the other purchases were in the open market. This is to be accounted for, in the first place, by the fact that compulsory

[4] See curve *A* of Figure 1 on page 539.

purchases under section 18 were not to begin until two years after the passage of the Act, and the Federal Reserve Board ruled that the first year for such purchases should begin January 1, 1916. Thus no purchases could be required in 1914 and 1915. In the second place, it is to be noted that the amount of purchases that could be required in any one year was limited to $25,000,000, but from this amount there had to be deducted such purchases as were made in the open market. In 1916 there were applications from member banks to sell bonds through the Treasurer but no allotments were made by the Federal Reserve Board to the Reserve banks because the open-market purchases of those banks exceeded $25,000,000. In 1917 the above mentioned $10,877,500 bonds were allotted by the Board to Reserve banks for purchase on April 1. This has been the only case since the passage of the Federal Reserve Act that the Board has exercised its power to require purchases under section 18.

During this period the market price of 2 per cent bonds was less than par while the conversion bonds were quoted at above par. It was thus a profitable operation for Federal Reserve banks to purchase the 2 per cent bonds in the open market and convert them into the 3 per cent securities without the circulation privilege. In 1916 more than $48,000,000 of 2 per cent bonds were purchased in this way, and $30,000,000 of these were converted. Probably the purchase of bonds might have gone on at an even more rapid rate if it had not been for a provision of the National Bank Act restricting the monthly retirement of bank notes by national banks. Most of the 2 per cent bonds were held by national banks and used as a basis of note issues. If a bank wished to sell its bonds, it would first have to retire the notes secured by the bonds. The usual method of retiring notes is for a bank to deposit an equivalent amount of lawful money with the Treasurer of the United States, whereupon the bonds are released. But, according to the National Bank Act, the amount of lawful money which national banks may deposit in this way for the withdrawal of their circulating notes is limited to $9,000,000 in any one calendar month. Dur-

ing 1916 this provision undoubtedly served to diminish the amount of 2 per cent bonds available for purchase by Federal Reserve banks.[5]

*The war period.*—The process of purchase and conversion of bonds and retirement of national bank notes, so actively under way in the period just reviewed, was rudely terminated by the entrance of the United States into the world-war. This event changed the whole situation. Both voluntary purchases in the open market and purchases from the Treasurer of the United States under section 18 ceased. The cessation of voluntary purchases was doubtless due in part to the desire of Federal Reserve banks to conserve their resources in order to assist in war financing, and in part to the discontinuance of profit on conversion operations. When the government put out the first issue of Liberty bonds at 3½ per cent, there was naturally a decline in the price of the 3 per cent conversion bonds. In February, 1917, they had been quoted at 102. In June they were quoted at 87.[6] Inasmuch as the 2 per cent bonds with the circulation privilege were at this time quoted at around 96, there would have been a considerable loss in a conversion operation.

Under the terms of section 18 the Federal Reserve Board might still have required the Federal Reserve banks to purchase at par up to $25,000,000 of the bonds securing circulation from the member banks through the Treasurer of the United States. But the matter was within the discretion of the Federal Reserve Board. Although during the two fiscal years ending June 30, 1919, there were thirty-four applications filed with the Treasurer by member banks to sell United States bonds for their accounts amounting to $27,145,000, the Federal Reserve Board did not deem it advisable to require the Federal Reserve banks to make any such purchases.[7] Immediately after our declaration of war, the Board stated that it would not require purchases if the 3 per cent bonds were below par and conversion could not

[5] See *Federal Reserve Bulletin*, April 1, 1916, p. 156; May 1, 1916, p. 215.

[6] *Financial Review*, Annual, 1918, p. 144.

[7] "Reports of the Treasurer of the United States," in *Annual Reports of the Secretary of the Treasury*, for year ended June 30, 1918, p. 555; for year ended June 30, 1919, p. 721.

be made without loss to the Federal Reserve banks. The Board was considering the question whether it would be justified at that time in asking for an amendment to section 18, authorizing the conversion of the 3 per cent bonds then held and the 2 per cent bonds subsequently acquired by the Federal Reserve banks into bonds paying a higher rate of interest. It was, however, also confronted with the problem of whether Federal Reserve notes could be issued in sufficient volume to take care of current needs resulting from the war and consequently whether it was not advisable to discourage curtailment of national bank circulation by discontinuing all conversion of 2 per cent bonds having the circulation privilege for bonds or notes without that privilege.[8] It was doubtless the latter consideration that ultimately influenced the Board in not asking for the amendment to section 18 that would have made conversion possible without loss to the reserve banks.

*The high bond-price period.*—The war factors interfering with the processes of bond conversion and retirement of national bank notes might be said to have prevailed until the latter part of 1920. But why was conversion not resumed in 1921, or thereafter, when credit and currency conditions had become much easier and there was no longer any danger of shortage? The answer, so far as voluntary purchase and conversion are concerned, is that the operation remained unprofitable for the Federal Reserve banks on account of the high price of 2 per cent bonds as compared with conversion bonds; so far as compulsory purchases under section 18 are concerned, nothing was done because there was no offering of bonds for sale by the member banks. Inasmuch as bonds were selling in the open market at above par it was only natural that banks should not have offered them for sale through the Treasurer of the United States where only par could be obtained. In short, the high price of 2 per cent bonds has obviously been primarily responsible for the failure of conversions since 1921.

Our next problem, therefore, is to explain these high prices. We may do so by a study of the supply of bonds available for

[8] *Federal Reserve Bulletin*, May 1, 1917, p. 341.

circulation and the demand for them. We have here an interesting case where the factors involved are rather definitely analyzable. The question of supply is simple. The issues of United States bonds available as security for circulation in 1913 are shown in Table II, page 542. It is necessary only to note that from October 31, 1915, to June 30, 1919, the amount of such bonds had been reduced from $913,317,490 to $793,115,530. This was due to the conversion of $56,256,500 bonds in 1916 and 1917 under section 18, and to the redemption of $63,945,460 bonds of the 3 per cent loan of 1908–18 after August 1, 1918. Changes in the supply of bonds are shown by columns *E* of Figure 1. Thus the period which we have under consideration began with a pronounced reduction in the supply of bonds as compared with the preceding period. Throughout the four years of the later period the supply remained unchanged.

On the other hand, the demand for these bonds underwent an increase during this period. This demand is almost entirely a function of the volume of circulating notes outstanding. In the case of the 4 per cent bonds it is true that a considerable portion is held for purposes other than the securing of note circulation, but the 2 per cent bonds are held almost exclusively for this purpose. In the present connection, however, our interest is confined to the price movements of the latter bonds inasmuch as they are the only ones involved in conversion operations. What were the forces, then, that were responsible for the increasing tendency to take out circulation during this period? The answer is to be found: (1) in the increase in the number and capitalization of national banks, providing a broader basis for the issue of notes; (2) in the increasing profitableness of note-issues on account of the lower interest rates that the banks have been able to obtain on loans; and (3) in the increased willingness of banks to avail themselves of the opportunity of issuing notes on account of the plethora of loanable funds.[9]

[9] The manner in which interest rates and the state of the money market affect national bank circulation has been explained by various writers. It is generally recognized that the profitableness of circulation and tendency to take it out vary inversely with the rate of interest and the tightness of the money market thus causing the so-called perverse elasticity of the circulation.

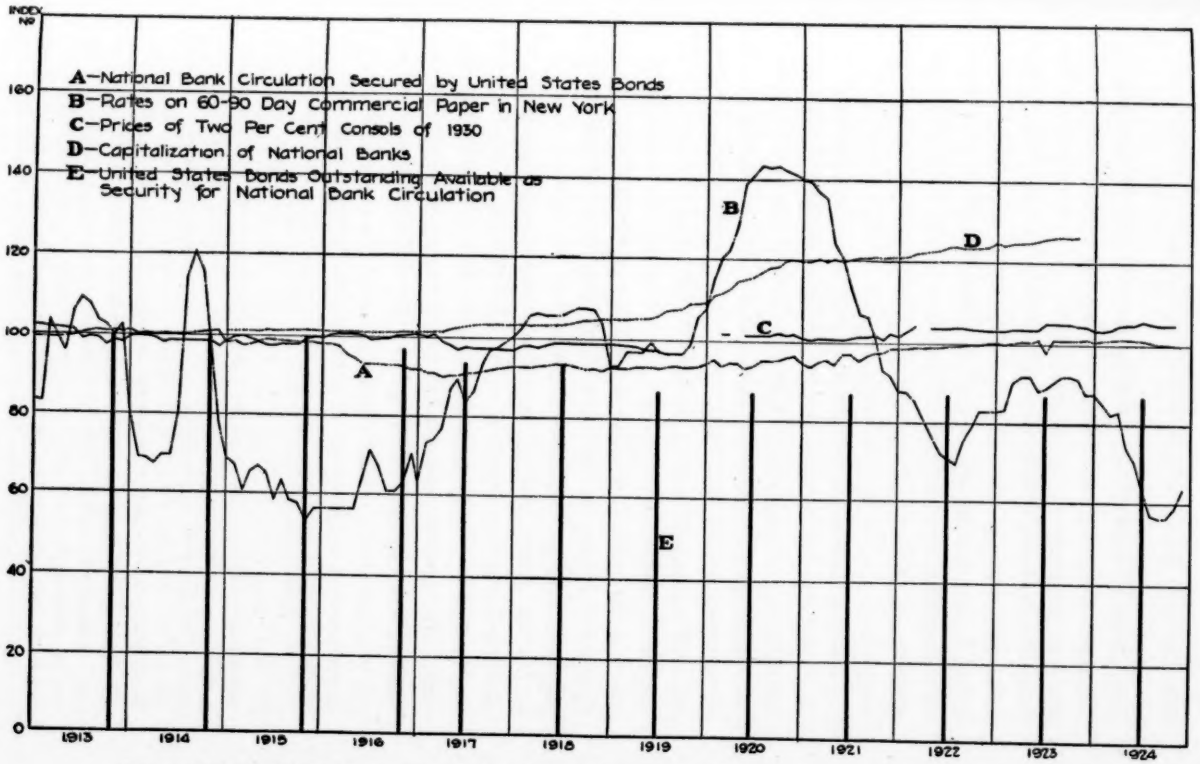


FIG. 1.—Index of prices of 2 per cent consols and factors in supply and demand, 1913–1924. (Average for 1913 = 100)

The various factors involved in the price of 2 per cent bonds are shown graphically in Figure 1. They are: (1) the price of 2 per cent bonds available as security for circulation;[10] (2) the total amount outstanding of bonds available as security for circulation;[11] and (3) the volume of circulation of national bank notes;[12] (4) the capitalization of national banks;[13] and (5) the rate of interest on bank loans.[14] In each case the data have been reduced to index numbers with the average for 1913 equal to 100.

From Figure 1, we see that a considerable jump in the price of 2 per cent consols occurred between the middle of 1919 and the middle of 1920. In the latter year the average monthly price was above par for the first time since 1913. This increase in price was probably due in part to the decreased supply of bonds between 1918 and 1919 as shown by columns *E*, and in part to a slight increase in the volume of circulation as indicated by curve *A*. Increased circulation, in turn, was doubtless due to the growth in the capitalization of national banks which became marked from the middle of 1919 as shown by curve *D*.

In the latter half of 1921 the curve for circulation (*A*) shows a decided upward movement, although the curve for bank capitalization (*D*) remained comparatively steady during the year. The upward movement in circulation at this time is to be explained by the fact that we were going through a period of

[10] Indicated by the average monthly prices of 2 per cent consols of 1930. (*Annual Reports of Comptroller of Currency* and figures furnished by C. F. Childs and Co.)

[11] As reported annually by the Comptroller of the Currency.

[12] Indicated by statistics showing the amount of notes on the first of each month secured by government bonds. (*Annual Reports of Comptroller of Currency.*) Use of these figures instead of those for the total volume of circulation outstanding eliminates the emergency currency issued under the Aldrich-Vreeland Act and also the comparatively small amount of currency secured by deposits of lawful money for purposes of retirement or pending deposit of bonds.

[13] As reported annually by the Comptroller of the Currency.

[14] Indicated by the average monthly rates on choice double-name 60–90 day commercial paper in New York. (From W. L. Crum, "Cycles of Rates on Commercial Paper," in the *Review of Economic Statistics*, January, 1923, p. 28, and from quotations in the *Commercial and Financial Chronicle.*)

rapidly declining interest rates with a plethora of loanable funds. The great drop in curve *B* after the crisis of 1920 is indicative of this condition. Thus banks could find an increased profit in circulation and were willing to invest their funds in government bonds. The upward movement in circulation was followed in the early part of 1922 by a pronounced upward movement in the price of consols (curve *C*). Apparently the upward movement in interest rates which occurred in the latter half of 1922 and in 1923 was not decided enough to affect appreciably the volume of circulation.[15]

Since the middle of 1921 the price of consols has been steadily over par, going at several times even over 104. The prices of the Panama two's have likewise been over par. With these high market prices, of course no bank was ready to sell its bonds under the terms of section 18 to the Federal Reserve banks through the Treasurer of the United States at par. Neither were the Federal Reserve banks inclined to take the loss involved in purchasing the bonds in the open market at the high prices prevailing and converting them into 3 per cent securities which were selling below par. The consequence was that during these years no conversions such as were contemplated by the framers of the Federal Reserve Act took place.

*The bond redemption period.*—On February 2, 1925, there began a new chapter in the history of the retirement of national bank circulation. It was occasioned by the redemption by the government of the 4 per cent loan of 1925, which was one of the issues available as security for circulation. This has led to a reduction in the volume of bank notes. All national bank notes must be secured by certain issues of United States bonds deposited with the Treasurer, except to the comparatively small extent that they may be covered by deposits of lawful money for the purpose of securing notes in the process of redemption or

[15] Incidentally, it is interesting to note how well Figure 1 indicates the perverse elasticity of national bank notes. The volume of circulation increased during and after 1921 at the very time when it was altogether unnecessary and even harmful because the country was being oversupplied with currency through the great flood of gold from abroad.

pending the deposit of bonds. It is obvious, therefore, that the bonds available as security form a limiting factor for the volume of note circulation. In Table II are shown the various issues of United States bonds on deposit and available as security for circulation on October 31, 1913, and October 31, 1924.

It will be noticed that during this period the total volume of bonds available as security declined from $913,317,490 to $793,115,530. To the extent of $56,256,500 this decline was due to

TABLE II

UNITED STATES BONDS ON DEPOSIT AND AVAILABLE AS SECURITY FOR BANK CIRCULATION, OCT. 31, 1913, AND OCT. 31, 1924*

| BOND ISSUE | TERMS† | ON DEPOSIT TO SECURE NATIONAL BANK NOTES | | TOTAL AMOUNT OUTSTANDING | |
|---|---|---|---|---|---|
| | | 1913 | 1924 | 1913 | 1924 |
| 2 per cent Consols of 1930 | Redeemable after Apr. 1 1930 | $604,264,950 | $589,086,200 | $646,250,150 | $599,724,050 |
| 2 per cent Panama Canal Loan 1916–1936 | Redeemable after Aug. 1, 1916; Payable Aug. 1, 1936 | 81,701,240 | 74,069,640 | 84,631,980 | 74,901,580 |
| 2 per cent Panama Canal Loan 1918–1938 | Redeemable after Nov. 1, 1918; Payable Nov. 1, 1938 | | | | |
| 3 per cent Loan 1908–1918 | Redeemable after Aug. 1, 1908; Payable Aug. 1, 1918 | 22,245,100 | | 63,945,460 | |
| 4 per cent Loan of 1925 | Redeemable after Feb. 1, 1925 | 35,302,700 | 76,687,050 | 118,489,900 | 118,489,900 |
| Total | | $743,513,990 | $739,842,890 | $913,317,490 | $793,115,530 |

* *Annual Report of Comptroller of Currency*, 1913, p. 19; *Federal Reserve Bulletin*, Dec. 1924, p. 944.
† *Federal Reserve Bulletin* April 1, 1916, p. 159.

conversions of 2 per cent bonds in 1916 and 1917, while the balance of $63,945,460 was due to the redemption of the 3 per cent loan in 1918. However, shrinkage in bonds available as security did not necessitate any reduction in note circulation inasmuch as there were still sufficient bonds available to take care of the notes outstanding. As a matter of fact there was even an increase in notes after 1918 so that on January 2, 1925, they stood at $772,318,867. On February 2, 1925, the government began redemption of the 4 per cent loan of $118,489,900 of which $76,687,050 had been on deposit on October 31, 1924, to secure note

circulation. The retirement of these bonds leaves only $674,625,630 still available as security. Thus a reduction in circulation is being effected as the outstanding notes formerly secured by the 4 per cent loan are gradually being sent into the Treasury for redemption. On September 1, 1925, the total circulation outstanding had been reduced to $723,551,797.[16]

The course of national bank circulation since the passage of the Federal Reserve Act may now be summarized. Conversion of 2 per cent bonds and retirement of notes were proceeding at an active rate until our entrance into the world-war. During this period the profit on conversion served as an inducement to Federal Reserve banks to undertake such operations. The war interrupted this process because conversions could no longer be carried on except at a loss and because of the unwillingness of the Federal Reserve Board to bring about any reduction of the currency at this time. Following the war period conversions were not resumed principally as a result of the high market price of 2 per cent bonds caused by the easy money conditions. Finally, since February 2, 1925, further retirement of notes has been occurring on account of the fact that the government has exercised its option of redeeming the 4 per cent loan of 1925. In the light of the foregoing, what are the future prospects of national bank circulation?

## THE FUTURE OF NATIONAL BANK NOTES

The future of the national bank notes will depend in part upon the course of the price of bonds serving as security for circulation, in part upon the fiscal policy of the government, and in part, perhaps, upon considerations involving the general monetary and credit situation of the country.

*The price of bonds.*—The purchase of 2 per cent bonds by the Federal Reserve banks either in the open market or from the Treasurer of the United States under the provisions of section 18, and their conversion into 3 per cent securities, might be resumed if the prices of bonds were such as to enable these op-

[16] *Daily Statement of U. S. Treasury*, September 1, 1925.

erations to be carried through with a profit or without loss, as was true in 1916 and the early part of 1917. In this connection something will depend upon the future course of the interest rate on loans. An increased interest rate would lessen the profit on circulation, decrease the demand for bonds with the circulation privilege, and tend to bring about a decline in their price. Probably, however, the price would not fall as low as in 1916 and 1917, on account of the diminished supply of bonds with the circulation privilege resulting from the conversions and redemptions that have taken place since that time, as well as on account of the increased potential demand resulting from the growth in capitalization of national banks. Moreover, it does not seem likely that the 3 per cent conversion securities will command as high a market price as they did in 1916 and 1917, on account of the presence in the market of the large supply of government bonds yielding higher rates. In short, it is doubtful if any retirement of national bank note circulation will take place under the present law as a result of conversion operations carried on by Federal Reserve banks.

*The fiscal policy of the government.*—As can be seen from Table II, further retirement of national bank notes to the extent of approximately $74,000,000 must occur if at any time the government should take advantage of its option of retiring the Panama Canal bonds which are now redeemable although not payable until 1936 and 1938. From the fiscal point of view it is clear that it would be to the advantage of the government to keep the 2 per cent bonds outstanding and to retire securities bearing a higher rate of interest when it has funds available for this purpose. Nevertheless, the Secretary of the Treasury has announced that the program of the Treasury Department calls for the retirement of both Panama loans "at some date after the passage of the contemplated legislation for the relief of national banks but before the callable date of the 2 per cent consols of 1930."[17] Moreover, the Secretary believes that the consols of 1930 which have no definite maturity but are redeemable after

[17] *Annual Report of the Secretary of the Treasury*, for fiscal year ended June 30, 1924, p. 36.

April 1, 1930, should be retired as speedily after the latter date as may be consistent with the other fiscal operations of the Treasury. It is evident that the policy of the Treasury as regards retirement of these bonds is not to be determined by the consideration of borrowing at the lowest possible rate.

It is the opinion of Secretary Mellon that notwithstanding the possibility of having to refund the retired bonds at an increased rate of interest, the importance of simplifying our currency system is paramount, and the increased rate in such event might properly be considered an investment in behalf of a sound and much-needed monetary reform. In addition to other things he mentions as an advantage to be derived from the retirement of national bank notes the fact that to the extent that these notes may be replaced by Federal Reserve notes, the more efficiently may the Federal Reserve banks function as a stabilizing influence on our credit and currency.[18] It is in connection with the last consideration, that is, the maintenance of control over the credit and currency situation, that particular interest at the present time attaches to the question of retiring national bank circulation.

*The general credit situation.*—There is much uncertainty concerning the future of currency and credit conditions in this country. To many students of banking the situation has presented elements of danger because of the possibility of overextension and the encouragement thereby given to the inflation of prices and the overexpansion of business, leading eventually to the severe crisis and depression that usually follow such a period of excessive activity. The basis of such an overextension of credit was to be found in the unbroken stream of gold that flowed into this country from September, 1920, to December, 1924. May not further imports of gold provide banks with reserves on the basis of which deposits may be extended to a degree that is undesirable from the point of view of sound credit and business conditions? Indeed, it is the opinion of some writers, for example, Dr. B. M. Anderson,[19] and the *Commercial*

[18] *Annual Report of the Secretary of the Treasury,* for the fiscal year ended June 30, 1924, p. 36.

[19] *Chase Economic Bulletin,* August 4, 1924.

*and Financial Chronicle*,[20] that credit already has been expanded to an undesirable extent giving dangerous encouragement to speculation. On the other hand, it is possible that we are on the eve of a period of large gold exports, relieving us of the danger of credit inflation, and even inspiring the fear of credit stringency. Or, finally, it is possible that in the future we may get little additional gold imports but may keep most of what we now have and that the fears expressed concerning the excessive volume of credit already outstanding may prove exaggerated. In view of the uncertainties involved, the future of the national bank note may be considered in the light of each of these three possible credit situations. The three possibilities will be considered in the inverse order as stated.

If credit conditions develop normally without either excessive imports or exports of gold, and with no signs of inflation, it is probable that retirement of circulation will continue to the extent that the Treasury Department exercises its possible discretion as to the redemption of bonds available as security for circulation. Retirement would then take place purely in the interests of a simplified and sounder currency system.

If the developments, however, should be in the direction of heavy prolonged gold exportation, accompanied perhaps by fears of actual credit stringency, it is questionable whether the Treasury Department would carry through its plans for the redemption of 2 per cent bonds with the concomitant contraction of currency.

On the other hand, if heavy importations of gold were to be resumed, the ensuing danger of credit inflation would emphasize the desirability of an active policy of national bank note retirement. To the extent that the notes were retired a vacuum would be created into which the new gold could flow without any power of causing inflation. Indeed active retirement in the interests of a sound credit situation may prove desirable even if a resumption of excessive gold imports does not materialize. It is conceivable that on the basis of the extended volume of credit at

[20] *Commercial and Financial Chronicle*, November 22, 1924; April 11, 1925; May 9, 1925.

present outstanding a business boom might develop to unhealthy proportions such as to necessitate a restrictive policy on the part of the Federal Reserve banks. If national bank circulation were retired, it would be possible for Reserve banks, without credit inflation, to increase commensurately their own issues of Federal Reserve notes accompanied by a corresponding increase of their earning assets. Then, in case it became necessary for them to restrict credit through the mopping-up process, that is, by selling securities, they would be in a stronger position to do so without trenching too heavily upon their earnings, which are even at present scarcely large enough to meet their expenses and pay the 6 per cent dividends to the stockholding member banks.

To what extent, then, may national bank circulation be retired for the above purposes? We have seen how the redemption of the Panama Canal loan through the government's taking advantage of its option would lead to the retirement of approximately $74,000,000 of notes. After these retirements, however, there would still remain close to $590,000,000 of national bank notes in circulation secured by the 2 per cent consols of 1930. Retirement of these notes through redemption of the bonds by the government as in the case just considered, is in the present instance impossible because the bonds are not redeemable until after April 1, 1930. They could be retired, however, in the way in which the Federal Reserve Act provided for retirement, that is, through the purchase by the Federal Reserve banks of the 2 per cent bonds serving as security and the conversion of these bonds into securities yielding a higher rate of interest but not having the circulation privilege. It has been pointed out that there is no limit on the power of the Federal Reserve banks to purchase these bonds in the open market nor on the power of the Secretary of the Treasury to convert into 3 per cent securities. The obstacle in the way of such an operation at the present time is that it could be carried out only at a considerable loss to the Federal Reserve banks for reasons that have already been explained, that is, the high market price of the 2 per cent consols and the low price of the conversion bonds. For example, on June 9, 1925, the 2 per cent consols were quoted at 103¼

while the conversion 3's were quoted at 96¾.[21] These difficulties could be overcome, however, if the Federal Reserve Act were amended to provide for a higher rate of yield on the conversion bonds than 3 per cent. The latter rate was fixed originally because it was believed at the time that 3 per cent then represented the level of the government's borrowing power, that is, that 3 per cent securities could be sold at par. Inasmuch as the 2 per cent bonds, with the circulation privilege were then selling at a little less than par, the 3 per cent rate made possible conversions at a slight profit to the Federal Reserve banks. We have seen how the actual course of market-prices in 1916 and the early part of 1917 led to a large amount of conversions. We have also seen that when conditions changed at the time of our entrance into the war, and 3 per cent conversion bonds began to sell below par, the Federal Reserve Board was contemplating recommending an amendment to the Federal Reserve Act providing for a higher rate of interest that would make conversions possible without loss to the Federal Reserve banks, but failed to do so apparently because it feared that any contraction of the currency was at that time undesirable.

If, however, the danger should be in the other direction, that is, toward an undue expansion of credit, the resumption of conversion operations could be encouraged if the Federal Reserve Act were amended so as to provide for a rate of interest on conversion bonds of such an amount that those operations could be carried out by Federal Reserve banks without loss.[22] This would mean a rate high enough to raise the market price of the conversion bonds even above par since the 2's are at present selling at such high prices and these prices might be expected to go still higher if the Federal Reserve banks entered upon an extensive buying campaign. As an offsetting factor, however, would be the possibility that as the Federal Reserve banks exercised more stringent control over credit or as business conditions

[21] *Investment Bulletin*, C. F. Childs and Company, July, 1925.

[22] If rapid conversion were desired it would also be necessary to repeal that provision of the National Bank Act which restricts deposit of lawful money with the Treasurer of the United States for the purpose of withdrawing bonds to $9,000,000 in any one calendar month.

improved, there would be an increase in the interest rates on loans, which by decreasing the profit on circulation would lessen the desire of banks to hold on to their 2's. Moreover, knowledge on the part of national banks that the government intends to redeem the consols on April 1, 1930, would tend to prevent their prices rising much above par. Probably a rate of 4¼ per cent on the thirty-year conversion bonds would meet the requirements.[23]

Such retirement of national bank notes would involve the government in certain fairly heavy costs on account of the refunding of the retired bonds at increased rates of interest. It has been seen, however, that the Treasury Department believes that other considerations than cost are of paramount importance. It should also be remembered that should there be any surplus earnings in the Federal Reserve banks above the requirements for dividends, most of them would be returned to the government as a franchise tax.

*Conclusions.*—It does not seem probable that further retirement of national bank circulation will occur as a result of conversion operations carried out under the present provisions of the Federal Reserve Act. Retirement will proceed, however, to the extent that the government takes advantage of its option of redeeming the two Panama Canal Loans, although even such retirement might be postponed if there should be heavy long-continued exports of gold. On the other hand, a resumption of large gold imports or the threat of credit inflation would emphasize the desirability of further retirement. In such an event, it is worth while bearing in mind the possibility of encouraging retirement through amending the Federal Reserve Act to provide for a higher rate of interest on conversion bonds.

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[23] The price of the Treasury 4¼s 1947–1952 on June 9, 1925, was 107.50, when the price of the 2 per cent consols of 1930 was about 103¼. The margin here would seem to be sufficient to allow for a considerable increase in the price of the consols due to Federal Reserve purchases. The exact interest rate on the conversion bonds, within limits fixed by the law, might be left to the discretion of the Secretary of the Treasury.

# A NOTE ON PROFESSOR CLARK'S ILLUSTRATION OF MARGINAL PRODUCTIVITY

In his brilliant and valuable book on *The Economics of Overhead Costs*,[1] Professor J. M. Clark gives an arithmetical example to illustrate the theory of distribution by marginal productivity which seems to the writer to involve a slip worth pointing out. By way of background a few observations are necessary. Discussion of that famous theory has strangely neglected the apparently fundamental question of whether distribution in accordance with its principles would actually result in an exhaustive division of the product of industry among the factors of production. That is, if each unit of each factor is paid what any one unit contributes to the total product, will there be enough product to go around, and no more? If this is not true, it is evident that the theory must be abandoned at once or fundamentally modified.

Omission of this outstanding and crucial question in the conventional treatment is the more remarkable in view of the history of the doctrine. Propounded by Menger in his *Grundsätze* the theory was "refuted" by Wieser, whom our textbook writers have so largely followed, on this explicit ground: that there would not be enough product to pay the factors on this basis. Wieser, as everyone knows, proposed instead a method of determining by simultaneous equations the "productive contribution" of the factors separately. I am not sure that it has been pointed out in the literature of the subject that Wieser's own equations can easily be shown to verify Menger's theory instead of refuting it. The equations, to be sure, seem to imply that the proportions of the factors in any one industry are rigidly fixed—a point also raised by J. A. Hobson and worked energetically against the theory in question. But even if this were true, as of course it is not, it is possible to find the addition to total product

[1] The University of Chicago Press, 1923. See pages 468–77.

resulting from the addition of a unit of any one factor, by changing the relative importance of different industries in such a way as to absorb this unit of factor without changing the proportions of the factors in any single industry. When this is done with Wieser's equations (or any similar ones such as those of Professor F. M. Taylor in his *Principles of Economics*) it comes out that the product-increment due to a unit of any factor is the same as the share found for that factor by solving the original equations as a simultaneous system.

In this connection, however, two further points are of interest. In the first place, to apply the method of Wieser at all it must be assumed that the product in all the industries is already reduced to homogeneous units in terms of price, which amounts to assuming the whole problem of the prices already solved, whereas in fact price is determined in the same process as the distributive shares. This, Professor Taylor himself makes specifically clear, and the point is especially developed algebraically by Professor Gustav Cassel. In the second place, the use of linear equations to represent the relations between factors and product contradicts the law of diminishing returns, in the absence of which there could be no competitive organization of industry or distribution of product.

The alleged refutation of the marginal productivity theory along the lines of Wieser and Hobson rests upon taking the marginal unit of a factor large in comparison with the total amount of it in use in the whole field of competition. Logically, the solution of the problem of the exhaustiveness of distribution under productivity principles depends upon the negligible size of the marginal unit, which is of course practically true in the bargaining situation. The theory was worked out by the use of infinitesimals, by Wicksteed and Edgeworth, to whom Professor Clark refers. The problem is in fact a perfect case of Euler's theorem for homogeneous equations, which theorem (for equations homogeneous in the first degree) is an exact symbolic statement of the economic proposition that the sum of the differential contributions of all the factors is the total product. The as-

sumption as to the form of the equation expressing the relation between product and factors of production means only that if all the factors are increased in a given ratio (say doubled) the output will be increased in the same ratio (doubled). This assumption is also evidently true under ordinary conditions.

Professor Clark's example referred to purports to give a demonstration of the proposition as to exhaustiveness without the use of higher mathematics, a thing evidently to be desired for purposes of exposition if it is possible. His illustration, abbreviated slightly, is as follows. Let 100 acres of land and 1,000 days' labor yield 2,000 bushels of wheat. Suppose that by adding 50 days' labor the product is increased to 2,060 bushels, diminishing returns coming into play. Now if we add 5 acres of land, the proportions of land and labor will be the same as in the original combination, and if the product is increased in the same ratio as both factors, the new output will be 2,100 bushels. Then the marginal contribution of the 50 days' labor is 60 bushels, or 1⅙ bushels per unit, and the marginal contribution of the 5 acres of land 40 bushels, or 8 bushels per unit of land. Multiplying the first figure by the 1,000 units of labor used in the original combination gives 1,200 bushels for the total share of the labor, and performing the same operation for the land gives 800 bushels for its total share, which together make 2,000 bushels, exactly exhausting the total product. And, "that this is a law and not a coincidence the reader may test for himself, using any figures he likes so long as they abide by the crucial assumptions of the problem."

This reasoning at once aroused the present writer's suspicions, because if the application of Euler's theorem to the case is correct, then it could not work out with the use of finite increments! But Professor Clark says truly that his illustration will work with *any* figures which do not violate the assumptions. That is, it will work just as well if the increments are ten or ten thousand times the original quantities as if they are small fractions of the latter; it will work just as well if the increments are

negative as if they are positive. Surely there is something wrong; he is proving quite too much. Generalizing the illustration by working it through with letters instead of numbers confirms the results.

Let $x$ units of land, with $y$ units of labor give $P_1$ units of product.
And $x$ units of land, with $ay$ units of labor give $P_2$ units of product.
And $ax$ units of land, with $ay$ units of labor give $aP_1$ units of product.

Then stating the same operations indicated by Professor Clark, we have,

$$\frac{P_2-P_1}{ay-y}\cdot y+\frac{aP_1-P_2}{ax-x}\cdot x=P_1$$

Cancelling the $x$ and $y$ in the fractional expressions, and clearing of fractions, gives

$$P_2-P_1+aP_1-P_2=aP_1-P_1$$

which is an obvious identity. That is, the reasoning does hold for any figures not violating the restriction as to proportions. But the interesting thing is that the $P_2$'s disappear entirely. That is, any assumption whatever may be made as to the product of the second or intermediate combination, without invalidating the result. The reader may work it out with the product of the second combination set equal to zero, or a negative quantity, or a magnitude greater than the product of the third combination or any negative or positive quantity whatever.

Surely it is clear that such figures have no meaning as representing the relation between shares in distribution and total product, if they have any real interpretation of any sort. It is a mere arithmetical puzzle, which, if the numbers are carefully chosen, *happens* to correspond fairly well with the conditions of our distribution problem.

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## REPLY TO PROFESSOR KNIGHT'S REMARKS

BY J. M. CLARK

Professor Knight has made a keen and searching criticism bearing on a decidedly neglected point in the mathematical theory of distribution, and it seems incumbent on me to respond, not so much for the purpose of defense or refutation as to explain further the nature, intent, and limitations of my arithmetical example and to suggest something of its meaning in terms of actual economic situations. I am glad to do so, because the passage in question, where it stands, is of the nature of an *obiter dictum* and the character of the main argument did not seem to justify (nor space permit) a full development of the assumptions and implications of one of the most abstract points in static theory.

Let me summarize Professor Knight's main contentions. First, he is criticizing my simplified arithmetical form of exposition, not the essential logic involved in the application of Euler's theorem, to which I had referred in a footnote and which leads to the same result. Second, he states that the essential logic of the case depends upon the use of infinitesimal increments, while the arithmetic illustration will work out with increments of any size, however large, which seems inherently absurd. Third, he shows that the equality which the example discovers is really an identity, but this he considers no objection except as it leads to the further result: fourth, that the answer would come out the same, no matter what apparently absurd figures one might choose for the illustration. Increasing one of the productive factors might reduce the former product or wipe it out entirely, and still this (negative) marginal product, added to the corresponding marginal product of the other factor, would equal the total amount produced. This he considers "an arithmetical puzzle which has no relation to the productivity of the factors in a technological combination—if it has any real interpretation of any sort." I shall try to supply such an interpretation. Fifth, he concludes that the agreement of my mathematical example with the results of Euler's theorem must be a mere coincidence

The first and second points are linked together. The arithmetical example, using increments of appreciable size, is subject to a certain inaccuracy, which is not important so long as the increments are not large, and the curves of productivity are fairly continuous. Since my only purpose at the time was to study some very much larger discrepancies introduced by overhead costs, it did not seem pertinent to intrude an exhaustive analysis of these minor discrepancies. The reader was warned that the general law of marginal productivity was not to be elaborated, but only briefly indicated, and the argument was intended in the sense: "Even if the sum of the differential products is equal to the whole, under the conditions assumed by static theory, actual conditions of overhead costs result in something more complex."

The example starts with a 5 per cent increase of labor on a fixed area of land, resulting in a 3 per cent increase of product, this being the differential product of labor. But this increase of labor constitutes also a decrease of land per laborer in the ratio of $\frac{5}{105}$: the two are not two separate facts, but complementary aspects of one ratio. To say that the decrease of land per laborer reduces the product per laborer, but by less than $\frac{5}{105}$, is only another way of saying that the increase of labor increases the product per acre less than 5 per cent. It is because of this identity that the sum of the differential products exactly absorbs the whole.

But when we pass from this bit of pure arithmetic to the question of how much the owner of a productive factor can command from an employer, it becomes clear at once that this identity does not cover the ground. With production going on at the original proportions of factors and no change imminent, will a laborer be worth the amount that would be lost if he deserted, or the amount that would be gained if another man were added? Presumably it might be either, or any amount between, if there is a difference between the two figures; and by so much is the differential worth of both land and labor indeterminate, leaving a margin for higgling. Hence the sum of the amounts

actually paid to the factors might be more or less than the whole product, but the total spread would be limited to the width of this zone of bargaining indifference.

This discrepancy, due to the difference between the effect of adding a man and of subtracting one, can be hypothetically eliminated in two ways: by reducing the increments to infinitesimals, as in Euler's theorem, or by selecting a positive increment of one factor and the corresponding negative increment of the other, as in the illustration here under discussion. Since these are two ways of removing the same disturbing factor, it seems more than a coincidence that they produce the same result.

On the whole, the most realistic course seems to be to deal with finite increments, admit some indeterminateness such as exists in the market, and confine the illustration to cases in which this is not so great as to vitiate the whole character of the result.

The fourth point is that the illustration proves too much, since it would hold good for any figures, however far-fetched or absurd. The general answer is that, if we assume an economically absurd figure for productivity, the formula will show absurd results, but that it is not the formula which is responsible for the absurdity. Suppose after putting on the land all the labor which can be of any use, we double the force and actually trample down part of the crop. Then the differential yield of labor is less than nothing. But doubling the land will save the farmer from this disastrous state of things and restore the original yield per acre, making the total crop more than twice what it was when the oversupply of labor was doing its worst. An $n$ per cent increment of land is worth more than $n$ per cent of the product, and the differential worth of all the land would more than absorb the entire crop. This is absurd, but it is merely the reflection of the absurd conditions of the problem; namely, the use of labor past the point of zero return. This could only be economical if the farmer were paid to keep labor at work in his fields. This is not likely, but the opposite has been known to

happen—for under our public land system people have been subsidized for putting a given area under cultivation, with the result that labor was often spread too thin for maximum yield. The last acre of land added less than nothing to what the labor would have produced without it, but this minus yield was balanced by the subsidy in the shape of the prospective gains of future ownership when the land would be worth a material sum. These limiting cases are instructive, even if not typical.

Ordinarily, a factor which costs something will not be used unless it promises to yield a differential product equal to its cost. But where all the factors yield a differential product, *all* must be in the stage of "diminishing return," thus ruling out the extreme and meaningless cases mentioned by Professor Knight. The proof of this need not be given here, as it is sufficiently familiar, and is not under attack in the present discussion.

In conclusion, let me point out that this entire argument does not affect the point about overhead costs, to which my arithmetical example was incidental. That point is that where there is a group of factors (materials and direct labor in a plant with spare capacity roughly meet this condition) which, if increased 5 per cent will increase the product 5 per cent, without any need of additions to the other factors; then the differential worth of these direct factors as a group, without any attempt to divide the product between them, would absorb the whole product and leave nothing for the indirect costs. Hence if these indirect costs, which in the long run are productive, are to be paid at all, it must be as a deduction from the differential product of the direct factors. In fact, our system of distribution regularly depends on just this sort of thing.

## REJOINDER
### BY F. H. KNIGHT

It is true, again, that the arithmetical example may approximately represent the abstract functional relation between product and factors, in some conditions in which one factor is used in excessive proportions, which conditions or something like

them may occur in fact. But under no conditions conceivable to me will competitive forces, i.e., economic behavior, tend to distribute the product according to such principles. Nor—and this is the important point—should it be distributed in such a way. It seems to me to go without saying that the principle of payment according to differential contribution can function only where the purchasers of the productive service in question are free to add or subtract small units of that service in their establishments. That is, it will operate only where and in so far as the service is transferable from one user to another and they compete for it effectively. Moreover, (the important point) it is theoretically correct, from the social standpoint, to have the variable and transferable factor paid in accordance with its differential contribution, and the fixed factor given what is left, if any. The free working of competitive motives tends to produce the socially desirable result—in the sense, always, that it tends to bring about that allocation of productive power, among allocations possible in the given conditions, which will maximize the value product. (Nothing is said about either the personal distribution of income or the correctness of the price measure of the product, or even the actual potency of the tendency.) In respect to fixed factors, of course, no problem of allocation exists.

The argument of Professor Clark's reply forces me to touch upon the larger issues in his book which it was not my original intention to refer to in this brief note on a special, technical point. My point was simply that, the relation between factors and product in his arithmetical example is not the relation between the variables in any function homogeneous in the first degree and the value of the function itself, and that consequently it cannot stand as a general statement of the relations between factors and their shares in distribution. I did have in mind, but did not state, the implication that one should hardly criticize the competitive system because it tends to distribute the product of industry according to his formula—which in many cases may have undesirable results—for the reason that competitive be-

havior does not have this tendency. The actual tendency of competition is always "correct," in the sense defined above, which to be sure has no final connection with real correctness, but is as far as the argument can be carried without injecting ethical judgments and standards into it. Now I feel compelled to develop a little, as well as to state, this practical implication of the argument.

At least I must dissent sharply from the statement at the close of Professor Clark's Reply, that "indirect costs in the long run are productive." This observation he makes rather parenthetically, but I submit that is the crucial question from the point of view of general theory in much of his book, and that its practical implications are misleading. His argument seems to me at many points to fall into the sort of slipping from one meaning to another of an ambiguous term which makes theorizing so difficult, and leads to so much error. It is true enough, literally, that the costs which are commonly called indirect (or constant) are productive in the long run; but it is true only because in the long run they are not indirect (or constant)! Any cost which has to be met is not really an overhead cost. The urgent requirement here is a more careful distinction between long-run and short-run viewpoints. The peculiar problems arise specifically from the prevalence of cost items which in the short run are indirect, do not have to be met, and are not productive in the effective causal sense, but which in the long run are reversed in character in all these respects. The fundamental technological fact underlying the problems is that shifts in demand and in the prices of products and productive services so commonly happen quickly and unpredictably while shifting productive resources from one field to another is a relatively slow process involving rather long-time commitments.

Professor Clark has done a piece of work whose high value I hope I am second to none in recognizing, in his keen portrayal of the anomalies in the workings of competitive forces in this situation. The only disagreement would be in regard to the relation between his work and economic theory of what we may call

the old fashioned variety. The vague set of conditions loosely referred to as "free competition," but never carefully defined and stated, are not very closely approximated in the facts of business life. Professor Clark, I know, does not mean to imply that this fact either invalidates or renders unimportant a correct theory of free competition, so long as business life contains an important element of that character or shows a considerable tendency in that direction. It is all a question of where and how to supplement competitive theory so as to make it more accurate and applicable.

For my own part, I hasten to agree and applaud the statement that conventional economic theory can be made more realistic than it has been, while keeping it just as "sound"—though there is always the danger of overestimating the degree of generality of modifying propositions. I should like to point out, however, that the theory of monopoly has fully as honorable standing as that of competition, and I think this is a second fact inadequately stressed and applied in much of Professor Clark's reasoning. The problems of maladjustment which he discusses are, generally, tied up with conditions involving more or less of the element of monopoly. A more careful application of the theory of monopoly in substantially its conventional form will, I think, go far toward reducing most of these problems both to intelligibility and manageability—farther in fact than will new and especially invented categories. A natural and inevitable insistence on the novelty of his contribution, and perhaps a certain fondness for paradox which is a feature of the author's delightful literary style, produce the impression that he is departing farther from established principles and methods than is in fact the case.

Perhaps I may say that it has been in my mind for several years that the presentation of economic theory, even on the level of school textbooks, could be made much more realistic and intelligible by breaking down the wall between competition and monopoly and recognizing the almost universal interpenetration of the two fields. This feeling was strongly confirmed by Pro-

fessor Clark's book, and also by another most important work which discusses monopoly situations much as if that were the universal and only type of economic life, and which also seems to me to confuse where it might clarify, through avoiding familiar terms instead of using them—I mean Professor Commons' *Legal Foundations of Capitalism*. We need to recognize that only in the case of such things as agricultural products which are graded and marketed by impersonal agencies do we have the formal conditions of competition without an element of monopoly. To be in a position to have a price policy, at all, is to have a monopoly of something, if only of a name for a product, or a location. A wheat or hog farmer cannot have a price policy, though an association of milk producers or raisin-growers may. The typical situation is the presence of an element of monopoly, but with competition the main underlying condition. This competition typically takes the form of substitution, but the difference between substitution of products and competition of producers is at most one of degree if it is more than a difference in names for the same thing.

## CONCLUDING NOTE

BY J. M. CLARK

I wish to add only a brief word on the larger issues raised by Professor Knight. He states: "The peculiar problems arise specifically from the prevalence of cost items which in the short run are indirect or constant, and do not have to be met, and are not productive in the effective causal sense, which in the long run are reversed in character in all these respects." This is substantially my own view of the matter, except that a fixed plant may be productive in the sense that product would be lost if the whole or any vital part were taken away, even though it has spare capacity and no "marginal productivity" in the sense Professor Knight has in mind. The essence of the case is the discrepancy between the short-run and the long-run situations.

It may be worth while pointing out that the term "indirect costs" is used in an accounting sense, referring to those classes

of items which the accountant cannot charge directly and has to allocate as "burden," and not referring to the constancy or variability of the costs in question. These costs are roughly constant in the short run, and afford the most available ready index of the short-run constant costs. In the long run they vary, but they are still indirect costs in the accounting sense. Thus there is no error in saying that indirect costs are, in the long run, productive.

It is true that I have underemphasized the monopoly phases of overhead costs. This is due to a desire to stress the fact that all industries, even the most competitive, are affected by this phenomenon, and that it is not confined, as so often assumed, to the limited number of recognized "natural monopolies." And I doubt the possibility of analyzing it successfully into a combination of two stereotypes: pure competition and pure monopoly. While open to conviction, I have meanwhile used the method which appeared available.

# BOOK REVIEWS AND NOTICES

*Problems of Public Finance.* By JENS P. JENSEN. New York: Thomas Y. Crowell Co., 1924. Pp. xviii+606. $3.00.

The appearance of a new text in public finance is welcome. This book follows the conventional organization, treating in separate parts public expenditures, public revenues, public credit, and fiscal administration. The employment of theoretical discussion is minimized and the emphasis is placed, rather, on illustrative material drawn chiefly from the United States. This policy, intentionally pursued by the author (p. ix) has both advantages and disadvantages depending upon the type of course that is being offered. In some parts of the work, however, one may well wish that the intention could have been otherwise.

At the close of each chapter is given a "bibliography," usually not of an exhaustive character but sufficiently well-chosen to give the student some additional references. A survey of these sources reveals all too few citations to periodical literature and scant references to foreign authors. A few chapters have practically no references at all. (Chapter xxiii, "Taxation of Business Incomes," three references; chapter xxiv, "Taxes on Profits," two references.) In this connection it is to be lamented that nowhere does Jensen discuss the literature of public finance.

The chief criticism to be directed against the work is that of scattered organization. The same subjects are referred to in several places, often in similar terms. Note, for example, the statements relative to the levy of direct taxes by the United States (pp. 225, 237; cf. p. 286). The Model Plan of the National Tax Association, moreover, is not adequately discussed though three phases of the proposal are mentioned in as many places (pp. 339, 379, 386). Or again, in the chapter on the shifting and incidence of taxation (chap. xii) a few references to concrete cases are made, but subsequently, there appear discussions of the incidence of a tax on mortgages (p. 247), customs duties (p. 320), personal and business income taxes (pp. 361, 396), and profits taxes (p. 403). The treatment of this difficult section in

public finance would have been more effective if the material was concentrated instead of being scattered.

Factual errors and misstatements of conditions appear to be quite few. Some, which at first may be so classified, are later modified. On page 191, Jensen states: "There is no way in which shifting can take place except through a change in the price of the commodities or services exchanged by the taxpayer." But on page 194 it is recognized that shifting may take place by a change in the quantity or quality of the product. In formulating a definition of income for taxation, Jensen discards the concept of income as a flow of psychic satisfactions (p. 348), but the concept of income as a flow of wealth without a decrease of capital is not considered. He adopts the accountant's concept of the difference of economic power between two points of time (p. 350), but without reference to Haig, and but few sources which treat of the concept of income are cited (p. 362). In applying the definition of income which is adopted, he is not altogether consistent. Though the income is to be a "net accretion," it includes sums spent for the satisfaction of physical wants but excludes business expenses. Nor is it necessary, according to the definition, that the gain be realized before it is treated as income. However, inasmuch as all economists are not agreed on this question, Jensen's departure can be overlooked.

A few detailed matters leave something to be desired. In discussing the taxation of National banks, the famous "Richmond Case" (41 S.C. Rep. 619) is ignored and it is stated in substance that bank shares may be taxed at different rates from other property in classification states (p. 267). The matter is not so simple. In the treatment of special excises the gasoline sales tax is not mentioned. It appears in Part III, "Public Debt," in the chapter on "Public Roads and Public Borrowing" (chap. xxxi). The movement for the partial exemption of improvements and buildings in the United States receives bare mention (p. 431), though Canadian plans receive considerable attention, and deservedly so. The question of shifting the war burden to posterity is raised (p. 486), but the discussion leaves much to be answered or assumed. The discussion of the problem of the taxation of the corporate excess which omits the treatment of bonded indebtedness, may be similarly classified (cf. p. 337 ff.). The unique income tax of South Carolina is not treated, though the acts of Wisconsin, Massachusetts, New York, and Oklahoma are considered. One typographical error should be noted (p. 581 n.). The tax rate for Ames,

Iowa, in 1921 is given as 2.345 mills on each dollar. This should be 234.5.

These criticisms, mostly of minor details, do not go to the roots of Jensen's book. The work is not without points of special merit. Part I on "Public Expenditures" is unusually well done and is a valuable addition to the literature on the subject. Public debt and fiscal administration are likewise satisfactorily sketched. The book is well done and is a teachable undergraduate text. It is a welcome addition to the field.

SIMEON E. LELAND

UNIVERSITY OF KENTUCKY

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*Accounting Principles Underlying Federal Income Taxes.* By E. L. KOHLER. Chicago: A. W. Shaw Co., 1924. Pp. xiii+489. $5.00.

This book is "a brief exposition of matters of present interest in the field of Federal Income Taxes. It is designed for the beginning student who desires a survey of the field and a guide for further study and reference." It serves its purpose well.

Part I of the text material is entitled "Introduction—Methods of Accounting." It includes a preliminary statement of the growth and importance of income taxes, coupled with important data regarding present American practice. Then follow some generalizations on alternative methods of reporting determined income.

In Part II the author plunges rather fearlessly into the most difficult phase of the income tax procedure: the determination of "Income from Sales and Exchanges." After stating that taxable income from a sale or exchange arises "where the fair value of the property received exceeds the basic values," he explains basic value and selling price as they are regarded by the act and the Department of Internal Revenue. He then proceeds to illustrate in well-grouped situations how taxable income is determined. The treatment of stock transfers in connection with corporate reorganizations is especially well handled.

Part III presents a running discussion of "Other Income," such as dividend, interest, rentals, foreign exchange, and compensation for personal services. In addition there is a brief description of tax-free income. This section is descriptive, rather than critical.

To the layman, Part IV on "Deductions" will probably be of

greatest interest. Most business men are willing to admit the receipt of income, but they wish to take full advantage of allowable deductions from the gross amount. The portions covering depreciation, interest, losses, and business expenses in general will be well thumbed. The chapter on non-deductible expenditures is carefully planned. Twenty-one such items are tabulated with references to detailed discussion of them in other parts of the volume.

Part V, on "Invested Capital" represents a well-thought-out presentation of a phase of the income tax problem which has at present lost its practical significance. Previous acts presented business men and economists with a practical problem in the incidence of income taxation. The excess profits tax compelled a careful study and differentiation of paid-in capital, earned surplus, and surplus arising from revaluation. As the author suggests, if invested capital is again brought into a tax law, difficulties in its computation will be greatly decreased.

Part VI takes up the subject of "Rates of Taxes and Returns." It contains useful charts and tables and illustrates clearly the procedure of filing individual and corporation tax returns.

The final section of the text material, Part VII, deals with the "Applicability of Income Taxes." The circumstances under which income of individuals and corporations are taxable under the 1924 act are carefully explained. This portion of the volume ends with a chapter on the review of returns, claims, and penalties.

A reader is impressed with the author's apparent desire to clear away the mystery from income tax procedure. This is a laudable desire and the nature of the treatment causes this attempt to be in a measure fruitful. It is more complete than the hurried surveys of the syndicated services, and it is less tiresome to the general reader than some of the more encyclopedic publications intended for the practitioners.

There is some trace of the recent compulsory revision of the text, which was originally based upon the 1921 act. For example, after discussing at some length the intricate proportional basis, under previous acts, for computing taxable profit arising from involuntary conversions, the author concludes the paragraph with a single sentence stating the simplified procedure under the new law.

In each chapter there are summaries of decisions bearing upon the points under discussion. They are well stated and illustrate clearly many otherwise difficult points. Three Appendixes follow the text ma-

terial, 62 problems for class assignment, 110 questions for discussion, and a copy of the Revenue Act of 1924. The Index is complete and well classified.

In conclusion, it is doubtful if there really exists a set of accounting principles underlying federal income taxes. One feels rather that certain accounting procedure has been imposed by or developed from the various tax laws. However, it is possible that standardization of accounting procedure, even if resulting from legislative enactment, may ultimately prove to be highly desirable.

C. RUFUS REMEM

UNIVERSITY OF CHICAGO

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*The Federal Trade Commission: A Study in Administrative Law and Procedure.* By GERALD C. HENDERSON. New Haven: Yale University Press, 1924. Pp. xiii+382. $3.50.

This is the first of a contemplated series of intensive studies of selected administrative bodies. Though made by a lawyer for the Committee on Administrative Law and Practice of the Commonwealth Fund, it is far from being technically legal in character and is worthy of careful attention by economists and others who are interested in the governmental regulation of industry. In harmony with the purpose of the study, the field is, in the main, limited to those activities which have to do with the regulation of industry and to the legal rights of the Commission. Little or nothing is said of the work of the Economic Division except so far as legal questions have been raised in regard to it, or of the Export Trade Division.

The author begins with a discussion of the political and legislative history of the Trade Commission Act and the Clayton Act. He then examines in detail the procedure of the Commission in dealing with complaints and with trade practice submittals. An entire chapter is devoted to the findings of the Commission and the method of arriving at them. This is followed by two long chapters dealing with "Deceptive and Dishonest Practices" and "Practices Which Restrain Trade," in regard to which the Commission has issued orders to cease and desist. A final chapter contains general conclusions and recommendations.

While the book contains much good descriptive matter, the author's chief contribution is to be found in his criticisms and recom-

mendations. The criticisms are numerous, and seem to be based on careful investigation and analysis. Some of them are decidedly adverse, the most serious being that the findings are commonly inadequate and in a considerable number of instances are unfair to the respondents. It does not follow, of course, that in all such cases the order to cease and desist was unwarranted. The author reports that he has examined a hundred legal dockets, taken at random, and many of these are reviewed in the book. It is evident that he has made a careful study of the published findings and of the decisions of the courts in reviewing orders of the Commission.

One of the most important of the recommendations is that more of the burdens of advocacy be placed upon those who are especially interested in the issuance of an order to cease and desist. This, the author holds, is one of the means by which the work of the Commission can be made more judicial in character, and has a number of other advantages. A second recommendation is that the reports of the findings be made less technically legalistic in character and more in the form of court decisions. This, he believes, would also help to make the work of the Commission more judicial, would give the reports a far greater educational value than they now have, and would make them a useful agency for the development of the law. A third recommendation is that the activity of the Commission be confined to cases in which a public interest is really involved. This, he contends, would relieve the Commission of many burdens that do not properly belong to it and would make it possible for it to give more attention to those that do.

It is interesting to note that some, though not all, of the changes in procedure that have recently been made by the Commission are in general accord with the author's recommendations. This is, perhaps, not true of the changes in regard to publicity, though even these are designed to accomplish results which, whatever he might think of the means, he clearly regards as desirable. Opposition to his recommendations will probably come from the same sources as has opposition to the changes made by the Commission. For this reason the book is a particularly timely one, and should be read by all who are interested in these changes. Quite apart from this, it is easily the best that is now available for an account of that part of the Commission's work with which it deals.

VANDERVEER CUSTIS

NORTHWESTERN UNIVERSITY

*Public Finance.* By HARLEY LEIST LUTZ. New York: D. Appleton & Co., 1924. Pp. xvi+681. $4.00.

The long-protracted dearth of American and English texts in public finance has finally given way to a supply not equaled since the closing decade of the last century. The latest American text which we have under special consideration in this review is Professor H. L. Lutz's *Public Finance,* which appeared last autumn. It was preceded earlier in the year by Jensen's *Problems of Public Finance,* and about three years by Hunter's *Outlines.* There appeared, about the same time as Lutz's book, a third edition of Bullock's *Readings* and also a noteworthy English text, *The Science of Finance,* by G. Findlay Shirras, director of the Labor Office of the government of Bombay.

Adams' *Science of Finance,* which appeared in 1898, has since that time been considered the outstanding American text in this field, but it was never revised and in later years has been largely displaced in our colleges by the various revisions of Professor Plehn's briefer and simpler treatise. During the past quarter of a century most of the notable contributions to public finance have been upon special subjects and in the form of monographs and articles rather than in that of comprehensive texts. The many changes which have occurred during the past few decades, particularly the expansion of governmental functions and the heavy expenditures occasioned by the war, have concentrated public opinion upon problems of public finance as never before in this generation, and have prepared the way for the new texts. Of these, probably none which has appeared will receive a more cordial welcome than the one here under consideration.

Professor Lutz is especially well qualified to write a text. His academic training, his teaching experience, his editorial and other contributions, his acquaintance with domestic and foreign literature, his practical contact with administrative problems in several fields, notably in Ohio—all give him a background and a confident touch that are in evidence throughout his work. His treatment is, on the whole, well-organized, well-proportioned, and follows in the main the standard outlines. He has included a few brief, well-chosen statistics, but has not yielded to the temptation to burden his text with numerous long tables which most students pass over. Nor has he added voluminous and useless appendixes.

With all of its good features, however, Professor Lutz has not produced such a complete and perfect treatise that the teacher of public finance will have nothing left to do. He has been left not only plenty

of opportunity to supplement and illustrate, but also to disagree, criticize, and correct, if so inclined. On the whole, the treatise may be described as conservative, possibly "liberally conservative," depending upon the prejudices or predilections of the reviewer. The author has shown some independence in criticizing the views of other writers. In most cases his points seem well taken; in some cases, as for example, in his classification of revenues, not all will agree with him. He will not be considered illiberal in his general attitude toward "economy" at the expense of curtailed education—though this is not surprising—and he is far from the somewhat reactionary position taken by Professor Plehn with respect to war finance.

But in no case would he be called radical. His book is not likely to be thrown out by conservative trustees or regents who oppose excess-profits taxes, publicity of income-tax returns, taxes upon capital gains, federal inheritance taxes, taxes for social rather than fiscal purposes, and even the present relative burdens upon land, to say nothing of such radical measures as proposed by the single-taxers, or by Rignano with reference to the inheritance tax. In fact, the more revolutionary matters are scarcely mentioned, or are altogether ignored.

Professor Lutz has not hesitated to take definite positions upon most of the controversial issues discussed. These positions and the finality with which they are taken by the text will probably be approved by most of his readers. Others, not entirely disagreeing with most of his conclusions, may wish that he had presented opposing considerations a little more fully before finally condemning them. But an author's space is not unlimited, and those inclined to disagree with him may thank him for not forestalling all of their criticisms. The present reviewer wishes to congratulate Professor Lutz upon his text, expects to use it in his classes, and as further proof of his appreciation, admits that he wishes he had as good a one to his own credit.

ROY G. BLAKEY

UNIVERSITY OF MINNESOTA

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*The United Mine Workers of America and the Non-Union Coal-Fields*. By A. F. HINRICHS, Ph.D., Columbia University. Studies in History, Economics, and Public Law, Vol. I, No. CX, 1, whole No. 246. New York: Longmans, Green & Co., 1923. Pp. 196. $2.00.

Mr. Hinrichs' book is based on an investigation of union and non-union coal-fields, and it ends with an argument for the extension of

the union throughout the entire industry. Is it, then, a picture of high wages and of attractive and independent villages on one side of the line, and of poverty and squalor and intolerable personal oppression on the other? Quite the contrary. Some such contrast, the author tells us, is what he expected when he went into the field. What he found was two halves of an industry surprisingly alike. There is something of a difference in personal liberty, to be sure, but even here Mr. Hinrichs points out that the grosser and better-known violations are strike phenomena and have little bearing on the miners' lives in times of peace. And in general "the facts seem to be that at any given time wages, hours, and living conditions are likely to be about the same." But if this is so, how, then, does the author arrive at his conclusion? What is his argument for complete unionization? It is based not on the conditions in the non-union regions alone, but on "conditions in the industry as a whole." The United Mine Workers has been largely —the author says solely—responsible for past improvements in miners' conditions on both sides of the border. Non-union gains have typically followed union gains. Moreover, the industry today, "because of the extreme competition engendered by overdevelopment, is a negative force that requires control. The workers secure this control through the union and through this alone, but they are balked in their efforts by the fields over which they have no control. . . . . Therefore they must bring in all fields." This, no doubt, will require new forms of protection for operator and consumer; but since the improvement of conditions in the whole industry is "limited by the most recalcitrant part," the non-union fields "must be organized . . . . as a preliminary step" in the solution of the coal problem.

It is Mr. Hinrichs' misfortune that such an army of investigators has marched and countermarched over his field since he reluctantly left the excitement of West Virginia for the quiet of Columbia in the summer of 1921. As a result of their work, little of his detail now seems new, and a little of it seems inaccurate. He tells, for example, how non-union miners, paid by the car, must sometimes heap up their loads into what he calls the "0–2 hump." Here for once his excellent ear for miners' talk had failed amusingly! The origin is not chemical, but Irish. It should be the "O'Toole hump," after the name of a certain strict and able superintendent. The scattered data on wages, moreover, are of course superseded by the exhaustive studies of the Coal Commission; and the conclusions to be drawn from the latter are rather less favorable to the non-union fields than Mr. Hinrichs'. The one most serious shortcoming of the book, however, is the failure to

analyze and make definite the claim that with 100 per cent membership the union could really "control the unruly industry and remedy its more glaring evils." Just why is it that the union can do nothing about the problem of unemployment, for example, under the present conditions? What, if anything, could it do if the whole industry were unionized? What would it have to do about that and similar problems in order to make complete unionization of any significance as a part of a program for bringing order into the industry? Some of the answers are implicit in the book, and perhaps more of them may be dug out of the reports of the Coal Commission, but Mr. Hinrichs' central conclusion requires—and lacks—their explicit statement.

All this, however, is not to deny the real merit of the book. It is only the materials for going farther that the Coal Commission has provided; it has produced no finer example of candid inquiry and clear-cut argument than Mr. Hinrichs' essay.

CARTER GOODRICH

UNIVERSITY OF MICHIGAN

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*Purchasing Power of the Consumer: A Statistical Index.* By WILLIAM A. BERRIDGE, EMMA A. WINSLOW, AND RICHARD A. FLINN. Chicago: A. W. Shaw Co., 1925. Pp. xxv+318. $4.00.

This volume contains the three essays awarded prizes offered by the J. Walter Thompson Company for their contribution to methods and material of use in the measurement of the purchasing power of communities. The terms of the contest emphasized especially the need for a technique for measuring the buying capacity of different localities and of different groups and for discovering variations due to changes in general economic conditions.

Two of the essays approach the problem from the standpoint of income. Mr. Berridge presents as his contribution a monthly index of the earnings of factory workers in the United States. He selects factory workers because of the importance of their income in the national total, because of the notorious variations in their earnings, and, more particularly, because of the availability of suitable data for constructing a current index that would be of practical business use. The general index of the money income of the whole group is converted into an index of commodity income, and both are tested as to their

reliability in use by a comparison with other indexes that show directly or indirectly cycles of buying power in the United States.

Mr. Flinn in a much briefer essay argues that the most useful statistical index of the purchasing power of consumers may be found in the ratio between the number of applicants for employment and the number of workers called for in the public employment offices of the various states. He emphasizes the timeliness of this index in that the weekly and monthly figures may be obtained within a few days after the close of the week or month. In the limited number of states where a "State Employment Office Index" is available, its simplicity would no doubt commend it. Mr. Berridge in his monograph shows the close connection between money income and the labor market. In his paper will also be found a brief discussion of the limitations of the employment index, especially as a long-run forecaster.

The third essay in the volume approaches the problem, not from the standpoint of income, but from the standpoint of expenditure, or the distribution of income among the consumers' various desires. Miss Winslow gives us a critical résumé of the various studies that have been made of household expenditures and attempts to evaluate "this rather confusing mass of detail" as a source of information in regard to the purchasing habits of individuals and of families.

It will be noted that the studies here brought together have value other than their contribution to the statistical measurement of the purchasing power of the consumer. That of Mr. Berridge is an important addition to the literature on factory workers' incomes. Miss Winslow's study clears the ground and organizes the material in a field where a critical survey was badly needed. But although these papers will probably be consulted by students with widely varying interests, there is an underlying unity in the volume that should be stressed. The monographs written as they are, two from the standpoint of income and one from the standpoint of expenditure, show the scope of the problem involved remarkably well. To measure the purchasing power of the consumer, not as an abstraction, but as a real person, living at a particular place, at a particular time, under particular conditions, it is indeed necessary to have an index that will show time-fluctuations in earnings for communities and for classes. But for the formulation of sound market policy we must also be able to forecast the uses of these fluctuating earnings in terms of specific commodities or groups of commodities. These monographs demonstrate again that we know more of aggregate income than of classified

income, more of individual income than of family income, and more of income in any form than of the expenditure of that income.

HAZEL KYRK

UNIVERSITY OF CHICAGO

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*Credits and Collections in Theory and Practice.* By THEODORE N. BECKMAN. New York: McGraw-Hill Book Co., Inc., 1924. Pp. xiv+465. $4.00.

This book "covers the general field of credits and collections, both foreign and domestic." Part I deals with the economic aspects of credit, credit instruments, kinds of credit classified according to financial institutions giving rise to them. Part II is a complete and up-to-date statement of sources of credit information. Part III discusses the organization and procedures of retail, bank, and mercantile credit departments. Part IV deals with the technical and legal aspects of collection problems.

The work is well written and more complete than anything else in the field. Its usefulness as a text would be enhanced by inclusion of questions and problems for class discussion. A few cases of credit analysis might well have been included. The author has done well to present the organization and procedure aspect of credits and collections. No treatment of business subjects from an administrative point of view can be said to be complete without a discussion of this phase of administration.

One drawback noted is that Part I attempts to squeeze a background of economics and finance into too few pages. So long as business curricula are as unorganized as they are this sort of writing may be necessary. In this particular case, however, the treatment seems somewhat unbalanced. One wonders whether the author could have presented a more adequate picture by sacrificing some detail to permit statement of several fundamental concepts omitted.

The material on financial statement analysis also seems a bit weak. Is it not too elementary for students who have studied accounting? Is it as elementary as it should be for students who have not had accounting? It seems to the reviewer that some of the detail concerning collections could well have given place to a more complete presentation of the sort of technique which lessens the need for collection effort.

S. P. MEECH

UNIVERSITY OF CHICAGO

*Palgrave's Dictionary of Political Economy.* Edited by HENRY HIGGS, C.B. Vols. I and II. London: Macmillan & Co., 1923. Vol. I, pp. 887; Vol. II, pp. 962.

An examination of the first two volumes of the revised and enlarged edition of *Palgrave's Dictionary of Political Economy* indicates what has been accomplished in the new edition. The original stereotyped plates have been used with limited modification in order to keep the cost of a new edition from being prohibitive. The additions have been gathered together in the appendix with an asterisk marking each topic which is treated in both sections. In the first volume, eighty-eight pages constitute the appendix, and in the second volume, eighty-one.

The significant changes in the reprinted section consist of additions which bring down to date figures on various subjects and of substitutions of recent material for that in the first edition where the copy does not have historical significance. The additions and substitutions are so adjusted that the original spacing is not interfered with. Most of the changes correct figures up to about 1910. Some of the topics, however, have been revised more recently. Although most of the revisions involve sentences or paragraphs, some whole pages are entirely rewritten. This is notably the case in the consideration of docks.

About one-third of the items in the appendix are additions to subjects treated in the main section of the volume. In some cases the discussions are merely carried down to date. In other cases historical evidence not formerly included is presented. "The American School of Economic Thought," for instance, is given much fuller historical consideration in the appendix than in the main section. The new items include: biographies, definitions, recent contributions to economic literature, business and financial practices of recent or war origin, historical developments in organization or policy of countries, and developments and procedure of economic significance growing out of legislation. Bounties on sugar, Bureau of Labor in the United States, commercial intelligence, copartnership, Drago doctrine, and engineering agreements are subjects indicative of the type of new material. Two sections of interest deal quite fully with economic libraries and with teaching of economics in Great Britain and the United States.

England, the United States, and English-speaking colonies are given the main consideration in additions as in the original work, but not to the exclusion of other countries. The general, groupings repre-

sentative of various lines of economic interest are necessarily maintained, since so much of the material reappears unchanged. The revisions and additions bring valuable material up to a recent date.

G. G. TAYLOR

UNIVERSITY OF CHICAGO

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*Topical Studies and References on the Economic History of American Agriculture.* By LOUIS B. SCHMIDT. Revised ed. Philadelphia: McKinley Publishing Co., 1923. Pp. 126. $1.50.

Those who have had occasion to refer to the first edition of this work, the most useful available covering the field down to date, will welcome the appearance of this new edition. The portion devoted to the references has been increased in size by about a third and ten new topics have been added to the original thirty-eight, all but one in the period since 1860. While material published since the first edition was put out in 1919 has been included, the expansion in size has also made possible the addition of references to earlier publications.